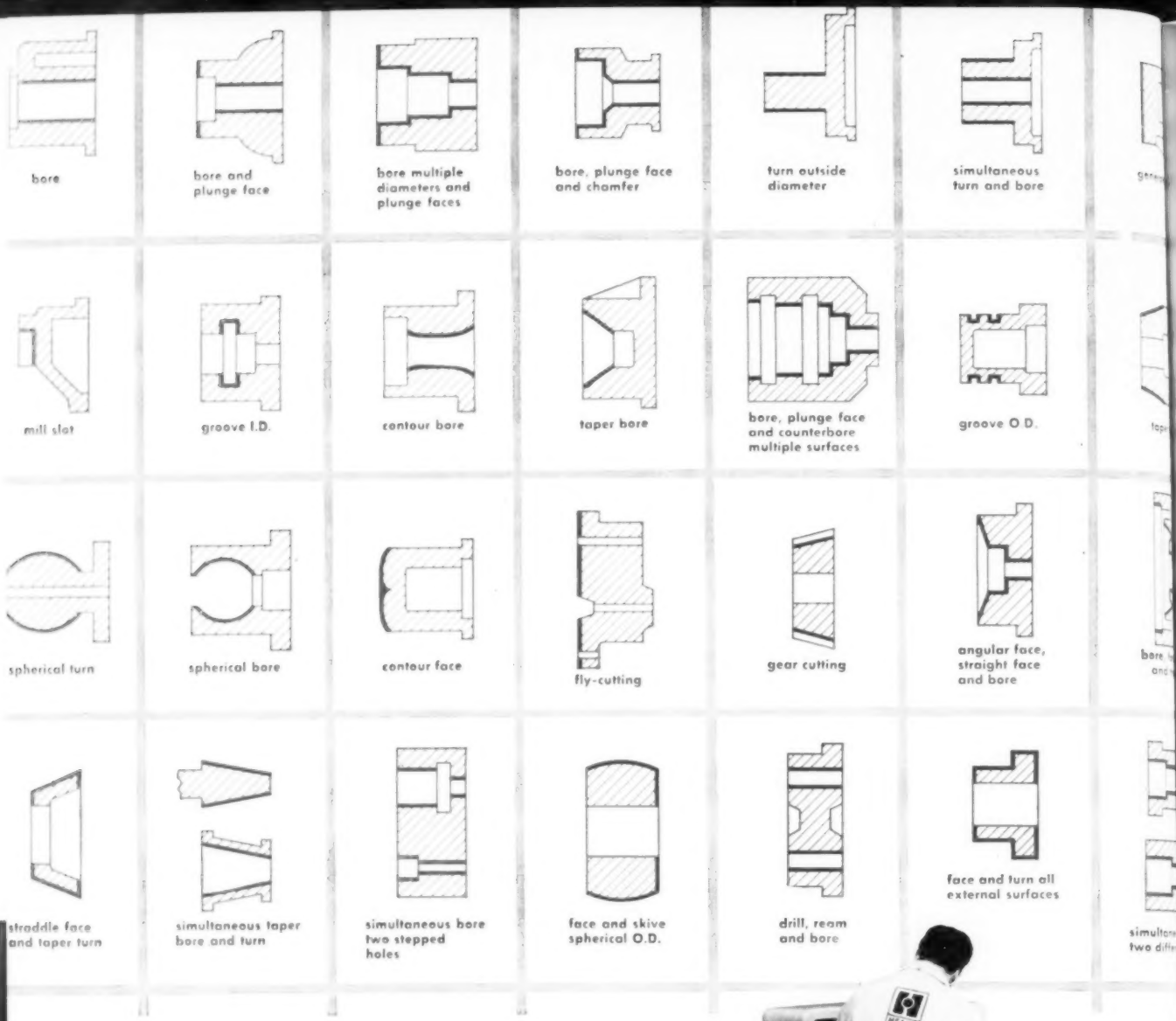
THE Tool Engineer

JUNE 1955

GEAR INSPECTION

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ASTE ENGINEERS



which of these operations can't be done on a Heald Bore-Matic?

With one exception, all of the operations shown here, plus many more, are routine for a Heald Bore-Matic — a *single-end* Heald Bore-Matic using a *single setting*, as a matter of fact!

What's more, practically any of these operations can be *combined* in a single, high speed automatic cycle — finishing a variety of different surfaces, either simultaneously or in sequence, at a single setting. This fact makes a Heald one of the most *versatile* and *productive* precision finishing machines ever developed. As you have probably guessed by now, the one job shown that a Bore-Matic can't do to advantage is gear cutting.

Whatever your borizing problem, you'll find that IT PAYS TO COME TO HEALD!

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THE HEALD MACHINE COMPANY

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Cover: Gear inspection plays an important role in gear production. Correctly applied it can reduce manufacturing costs as well as solve product quality problems. These and other considerations are discussed in the article beginning on Page 111.

The Tool Engineer

Volume XXXIV, No. 6 June 1955

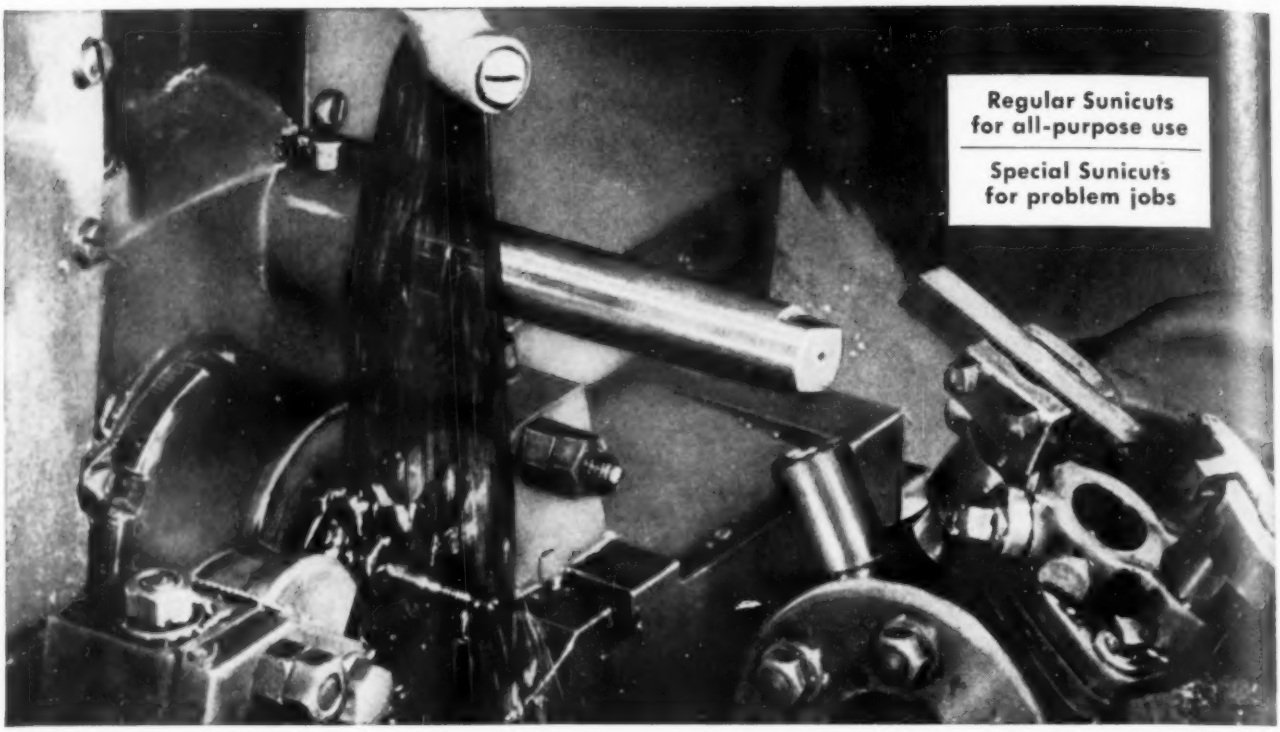
TECHNICAL ARTICLES

ASTE NEWS

DEPARTMENTS

PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION

THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*



to assure peak production . . .

THERE'S A SUNICUT OIL FOR EVERY SCREW MACHINE OPERATION

Today's Sunicut cutting oils are the result of years of research and on-the-job testing. And they're versatile, too. In many plants *all* screw machine jobs are being handled by a single Sunicut grade.

For the problem jobs, Sun makes a wide variety of special Sunicut oils, each designed to do the job better.

Your Sun representative has the practical know-how to analyze *your* problems. Working with Sun's experienced engineering staff, he's ready to help you pick the Sunicut oil that will give you the tolerances and finishes you want.

The Sunicut series for screw machines is only part of a large selection of non-emulsifying and emulsifying cutting oils available to help you get peak production at the lowest possible cost.

For complete information about Sun cutting oils see your Sun representative... or write Sun Oil Company, Philadelphia 3, Pa., Dept. TE-6.

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The Tool Engineer

A Promising New Vista

With the increasing complexities of modern production machines involving transfers, programming and gaging, the control circuits necessary for proper functioning are becoming more and more involved. Frequently, a control panel is as large as the machine it serves. Occasionally, it is even larger. Physical size and quantity of control components have posed problems limiting the practical number of functions in a machine. When maintenance and foolproof operation are added, the problems are compounded.

A potentially promising answer to these problems and one that may open a whole new vista in circuitry is the development of a control package having no moving parts. This solid-state control method, announced by Westinghouse at its recent Machine Tool Electrification Forum, performs the functions of relays with neither bearings which are subject to maintenance nor contacts which are subject to erosion and faulty operation. The term Cypak has been coined for this control method to indicate packaged cybernetics.

Using material properties of magnetism and semiconductivity, Cypak relays are similar to transistors and magnetic amplifiers in operation. They are entirely free from maintenance and the circuitry is considerably simplified. Also, low-voltage control circuits may be used effectively. In fact, the output of thermocouples or simple photocells can be used as the input to such a relay.

Although the package unit can perform any relay operation by static switching, it cannot be substituted direct into a circuit to replace standard components. Each circuit must be designed for its specific set of conditions. At present, the new system has little size advantage but, because of its versatility, it ultimately will be smaller as well as cheaper.

With this development, a new tool has been added to the kit of the tool engineer so he can extend the practical range of automation and improve production methods.

John W. Greve
EDITOR

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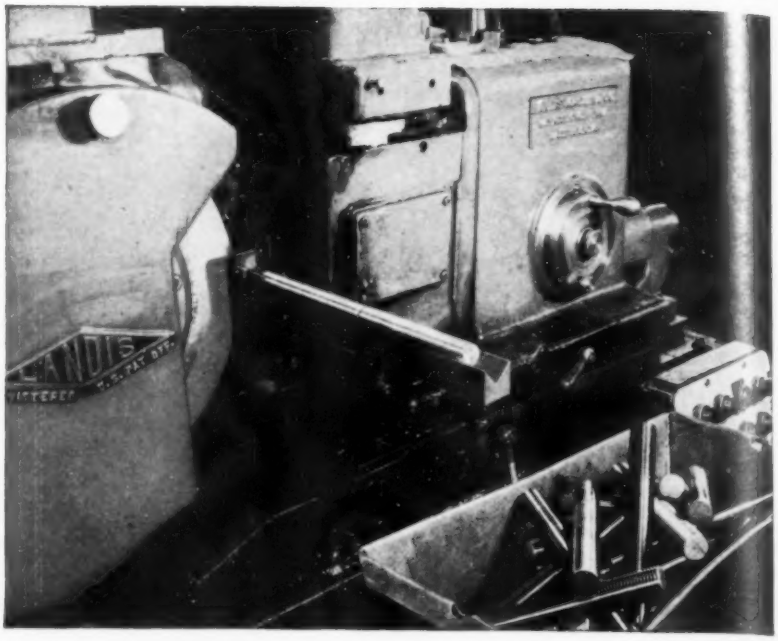


Threads 7¼" per Minute by CONTINUOUS GRINDING

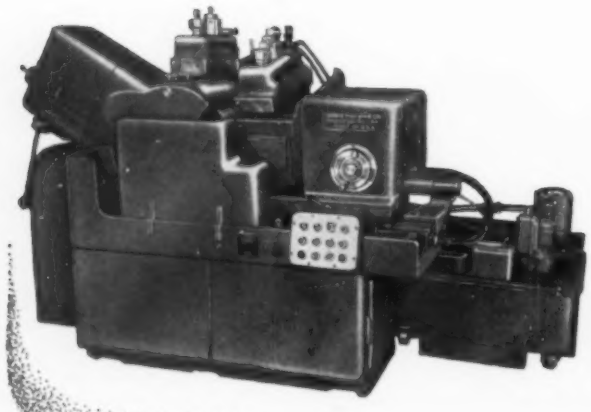
LANDIS Centerless Thread Grinders are being used at the Kilbourn Engineering Company in Milwaukee, Wisconsin, to produce continuous threaded studs for high-pressure high-temperature service.

Studs ranging from ⅝" to 1⅜" in diameter are threaded from blanks of SAE 4140 steel heat-treated to a 260-320 Brinell hardness. In the operations illustrated, 1⅛" 8 pitch UN threads must be generated 10" long to a Class 7 fit to meet ASA standards (Manual B1.4). These threads are produced with LANDIS #1 Centerless Thread Grinders by continuous thru-feed grinding at the rate of 7¼ linear inches per minute, *or better.* The excellent quality and smooth finish of the ground thread has reduced final assembly time and minimized galling.

Centerless Thread Grinders, manufactured exclusively by LANDIS, are designed for the high-speed threading of a wide variety of workpieces from 1/16" to 4¾" in diameter. Blanks having one or more diameters, requiring threads on the outer diameter, can be threaded automatically by the thru-feed process used here.

Centerless Thread Grinding, by utilizing the "up-grinding" technique, is also well-adapted for threading workpieces of high hardness and coarse pitch. This process allows up to 30% higher work surface speeds, and often eliminates secondary threading passes required by other methods.

For further information, send specifications and ask for Bulletin E-97.



LANDIS

LANDIS *Machine* COMPANY

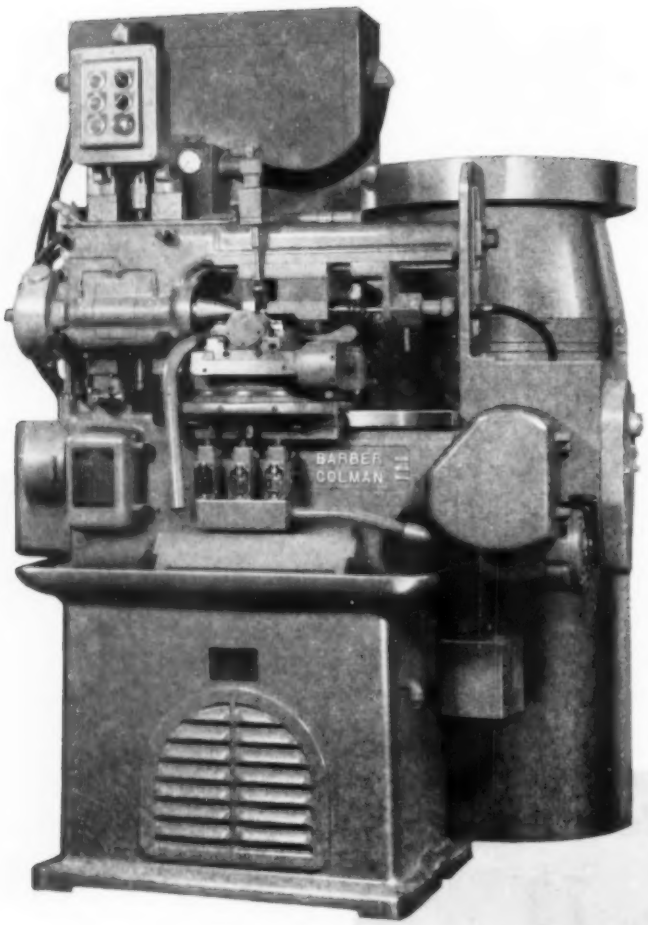
WAYNESBORO • PENNSYLVANIA • U.S.A.

390

NEW LOW GEAR COSTS

Gears 16 Pitch or Finer...with

FULLY AUTOMATIC GEAR HOBBING



As more and more gear operations are modernized to place them on a competitive basis, automatic gear hobbing equipment becomes an essential approach in reducing gear costs. Since 1937 Barber-Colman engineers have been working closely with major gear producers in the application of automatic gear hobbing. At first, automatic hobbing applications were made in the watch gear and instrument fields. Later, machines were built for medium pitches in other fields, such as fishing reel gears. The latest Automatic No. 6-10 Hobbing Machines are designed specially for cutting automatic transmission and speedometer gears to meet the required rate of production on an automatic production line.

First Automatic Cycle Hobbing Machine 1936.
First Fully Automatic Hobbing Machine 1937.
Automatic Hob Shifting for Increased Tool Life 1944.

B U I L D E R S O F P R E C I S I O N G E A R

HIGH-PRODUCTION PLANT REPORTS SAVINGS IN UNIT-COSTS WITH FEWER GEAR REJECTS

In this particular production plant, fewer gear rejects are occurring. An overall reduction in cost per gear has been effected through reduced man-hours and continuous high-speed output. One of a battery of machines performs as follows:

Automatic Cycle — 356 Hob RPM, .030" feed per rev., 34-second complete cycle time, 1 per load.

Speedometer Gear — 19 teeth, 8°3'22" RH helix angle, 26 DP, .850"OD x 3/8", 25°PA.

Class C Accurate Unground Hob — 2 3/8"OD x 3" face x 3/4" bore, 3-thread, 25°PA, 4200 pieces per sharpening.

COMPLETELY AUTOMATIC CYCLE PROVIDES CONTINUOUS HIGH-SPEED GEAR CUTTING

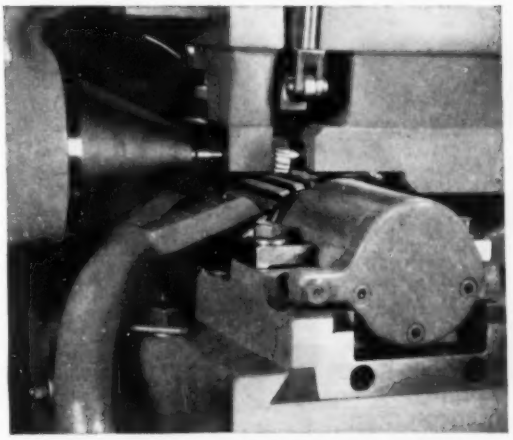
Blanks are automatically loaded through a hopper-feed system and positively located and clamped on a solid arbor in cutting position. The cycle sequence includes rapid traverse to the hobbing position, lowering of the work slide to cutting depth, hobbing the blank, raising the work slide, rapid traverse to the right, and unload. A new blank then is automatically presented for hobbing and the cycle repeated continuously until the machine is shut off. The machine is equipped with an automatic hob shifter which moves the hob to a new cutting position after each cycle.

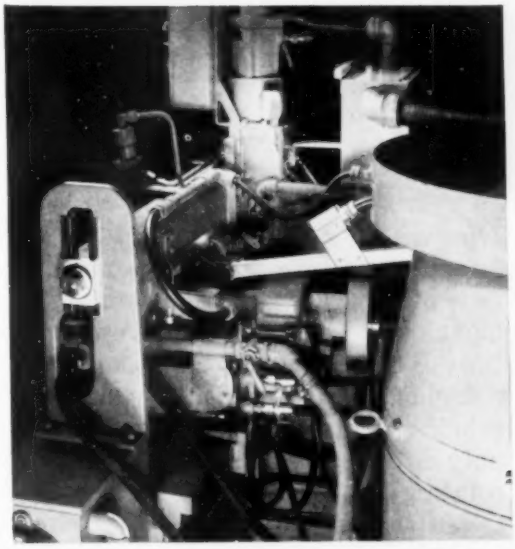
ADAPTABLE TO WIDE RANGE OF LONG-RUN, HIGH SPEED GEAR PRODUCTION

This type of cycle arrangement is adaptable to many similar long-run gear cutting operations within the general range of 16 pitch and finer, depending upon the particular gear specifications. The cycle is arranged to suit the requirements of the job, and tooling, feed, speed and cycle-timing will depend upon the required production and gear specifications.

ENGINEERING SERVICE AVAILABLE WITHOUT OBLIGATION

Check your high production gear operations to determine whether you are maintaining a competitive cost basis. Barber-Colman engineers will gladly consult with your gear production people to demonstrate the cost-saving benefits of automatic hobbing. Ask your Barber-Colman representative to arrange an appointment for you, or write directly to Automatic Hobbing Engineering. No obligation.





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HOBS AND MACHINES SINCE 1911

With Permanent Magnetic Chuck

NEW *Vulcan*

MOTORIZED ROTARY TABLE

for lapping and grinding

(not an index table)

With Lapping Plate

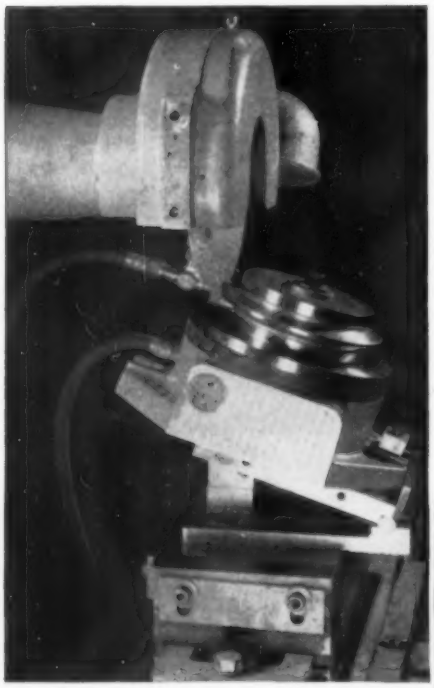
FASTER
circular precision grinding!

Now with this table and with less effort you assure highest standards of accuracy, flatness, finish and close tolerances. At the same time you eliminate slow and complicated tool setups. You cut grinding time greatly by using only cross feed while the table is rotating at infinite speeds between 40 and 100 RPM.

For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6″ and 10″ in diameter.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied — grind flanged studs or bushings — bearing spacers — forming rolls — cutters — convex or concave surfaces — punches or dies (radius or angle).

Lapping? Yes — and in micro inches. For the 6″ and 10″ table, lapping plates of 12″ and 16″ are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. *Write for circular.*



Work clamped to motorized table, mounted on sine plate. Surface grinder application.

Major Vulcan Services

Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

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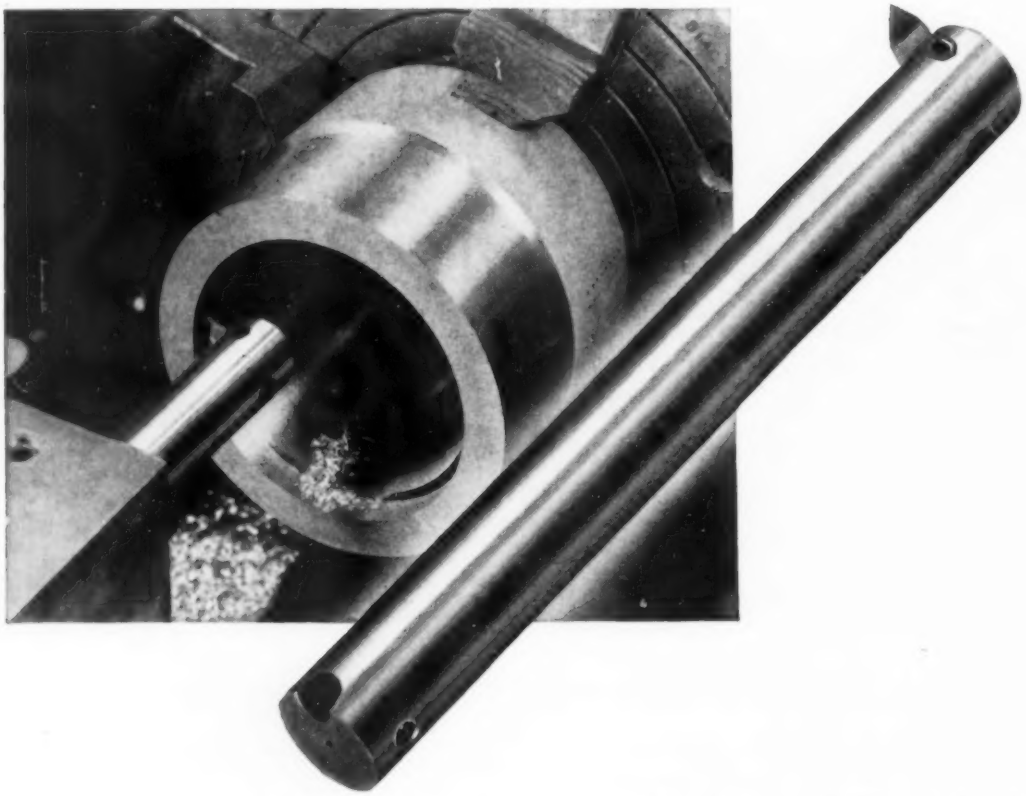
Mallory No-Chat* Boring Bars Can Cut Your Machining Costs



HOW MUCH MONEY and time are being wasted in your shop by chattering tools?

A unique development by Mallory—*No-Chat* boring bars and tool shanks—now puts an end to this waste. Even those tough inside cuts with long overhang of the boring bar can be made with an absolute minimum of tool vibration, and at substantial overall savings in machining cost.

No-Chat boring bars are made of a special high density alloy. Far heavier, more rigid and better heat-conducting than steel, they stop vibration at its source. They cost more . . . but they quickly pay for themselves on the job.

Far more production between grinds. Tools run cooler. Wear due to vibration is drastically reduced. Down time is slashed.

More metal removed per cut. Machines can be set for heavier cuts without danger of chatter.

Cleaner finish. Reduced chatter often eliminates need for finish grinding. You don't cut chips on the way out.

No-Chat boring bars and tool shanks are re-usable. Tips are readily replaced. This unique metal does not anneal, and has no grain-growth problems.

Write to Mallory today for our Technical Bulletin giving full data on *No-Chat*, and available sizes of stock for use in the tools you are now designing.

*Trade Mark
Patent Applied For

Expect more . . . Get more from MALLORY

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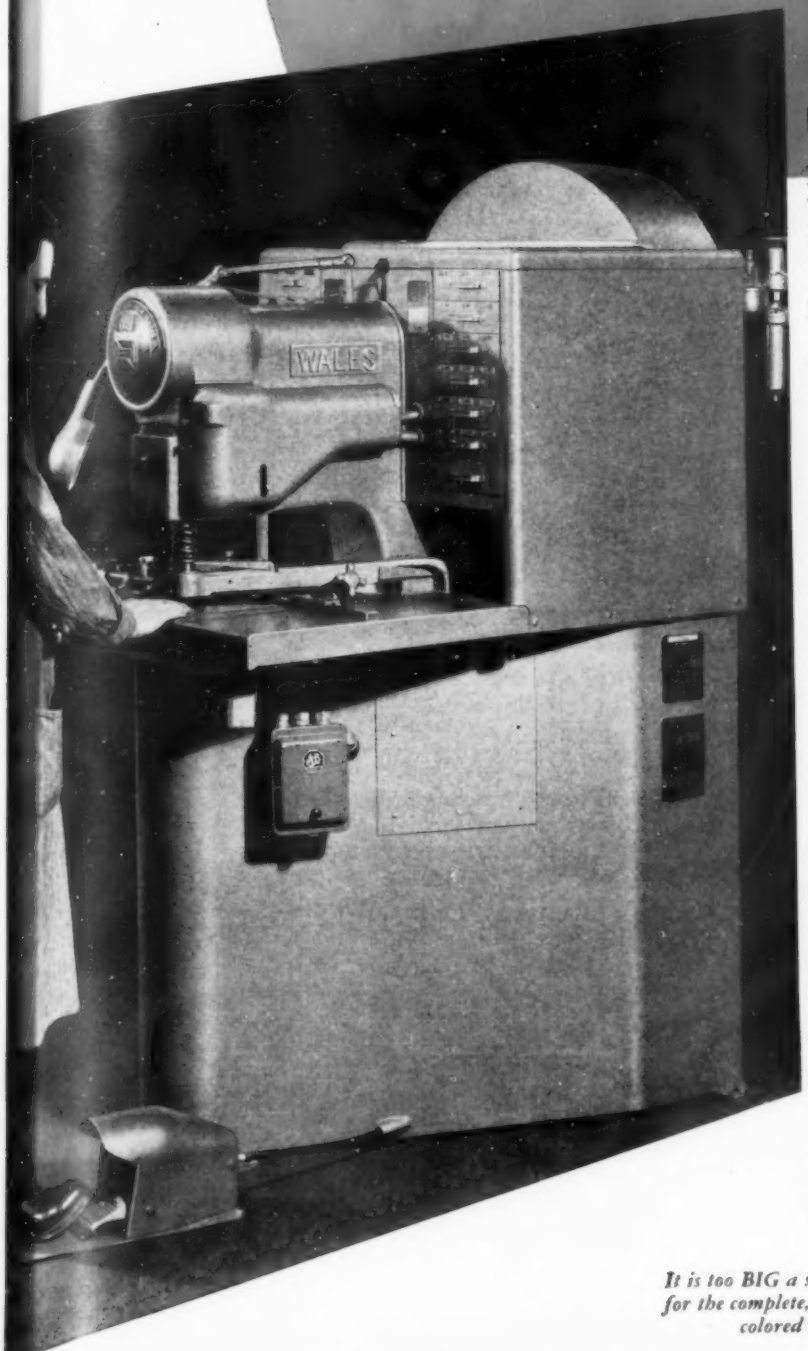
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

HOW WALES Fabricators produce FASTER and GREATER SAVINGS...

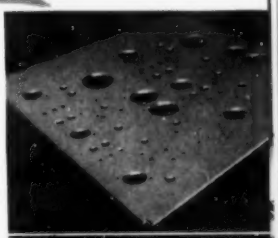


NO OTHER MACHINE LIKE IT!

Rapid interchangeability of punches and dies for various hole diameters plus faster notching and nibbling operations provide the typical astounding time studies described below.

How long would it take you to make similar parts?

Wales Fabricator, the only machine of its kind, permits working direct from blueprints or operation sheets . . . *no templates required.*

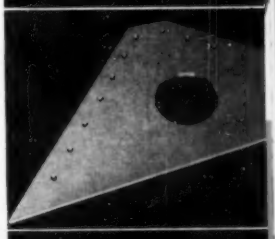


ELECTRONIC CHASSIS 12½" x 11½", with 118 holes and 4 notches was completed including setup in only 32.45 minutes and subsequent pieces in

6.44 minutes.

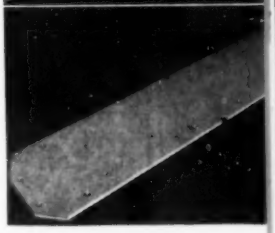
A part of FARM EQUIPMENT, 72½" x 22" with 32 holes and nibbled cut out was finished including setup in only 12.01 minutes, subsequent pieces in

2.32 minutes.



AN AIRCRAFT part 7½"x 4½" with 15 holes and 1 notch was produced including setup in only 3.52 minutes and subsequent pieces in only

54 seconds.



Part of an ELECTRIC REFRIGERATOR, 39⅞"x 8½" with 10 holes and 4 notches was fabricated including setup in only 5.61 minutes and subsequent pieces in only

37 seconds.

It is too BIG a story to tell here so write today for the complete, fully-illustrated, functionally colored Wales Catalog 10-AA.

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George F. Wales, Chairman

593 Payne Avenue, North Tonawanda, N. Y.

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Specialists in Punching and Notching Equipment

THEY WOULDN'T BELIEVE IT

—until they SAW it!

Seeing was believing for a group of mechanical officials from one of the mid-west's most prominent earth moving equipment builders.

Frankly they just wouldn't believe that the new 32" "AMERICAN" Pacemaker Lathe would effectively use 60 horse power and cemented carbide cutting tools in machining rough alloy steel forgings. So they came to see for themselves and they saw:

1. Cuts 1⅛" deep.
2. Cutting speed 300 feet per minute.
3. .030" feed.
4. 60 to 65 horse power registered by horse power meter during the maximum cuts.
5. Not a shimmy or whimper from the machine.

They were amazed and convinced.

This new model Pacemaker is endowed with the power, stamina and convenience that combine to produce a thoroughly dependable and highly productive unit.

Bulletin No. 44 tells all . . . have one?

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

MASSIVE FLYWHEELS COMPLETED IN ONE AUTOMATIC OPERATION

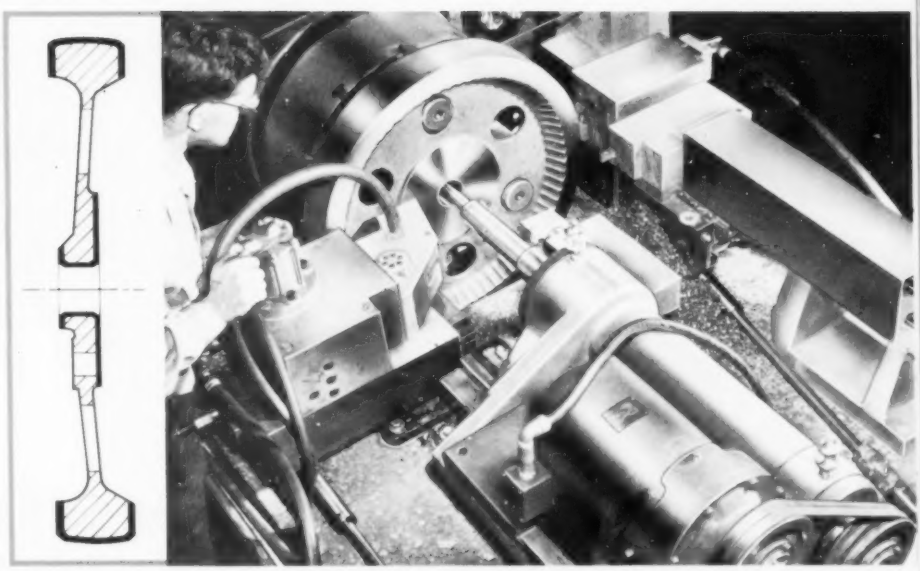
Simplimatic Automatic Lathe and Balancer Team Up to Drive Down Costs

All machining on this 320-lb. cast-iron hay baler flywheel is completed in one chucking on this Gisholt Simplimatic Automatic Lathe. The part is chucked in three cored holes in the web. V-grooves in the chuck jaws centralize the work and give a true-running web. Spring-loaded jacks provide support and eliminate vibration.

Four front slide tools straddle face the rim, face the center pad and chamfer the back edge. A cam-guided tool on the rear slide turns the OD crown and another tool chamfers the outer edge of the rim. Both slides have automatic tool relief. Two tools on a piloted speeder boring bar mounted on the center slide finish the bore and a third tool chamfers. A back boring attachment, operating through the spindle, completes the job by shave facing the back pad and chamfering the bore. Eleven tools machine ten surfaces in seven minutes f.t.f.

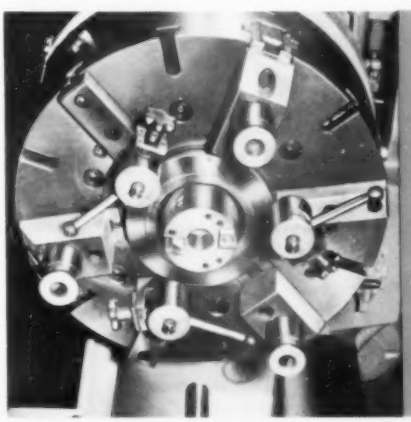
While a new workpiece is being machined, the operator places the completed part in a Gisholt 14E Static Balancer. This is arranged with correction equipment so that unbalance can be measured, located, corrected and inspected in one handling.

From rough casting to machined and balanced flywheel—all done by one operator and the two Gisholt machines.

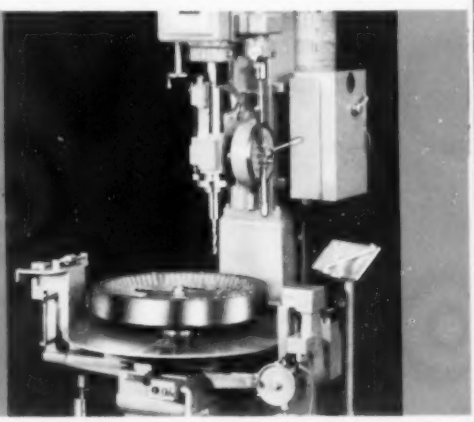


Heavy lines show ten surfaces machined in one chucking.

Close-up of workpiece and tooling. Note speeder boring bar arrangement to give required cutting speed in small bore diameter.



V-grooved chuck jaws and spring-loaded jacks. Back boring attachment tools feed out through the spindle to face back pad and chamfer bore.

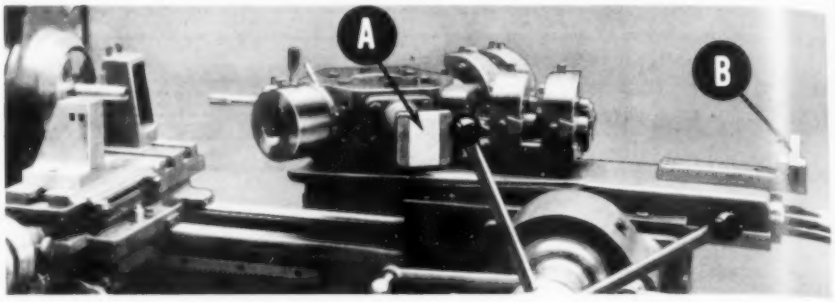


Gisholt 14E Static Balancer with integral correction equipment. Up to 600 ounce-inches of unbalance can be quickly measured.

TIME-SAVING IDEAS

HOW TO DO LONG SHAFTS ON SHORT LATHE

Ram Type Machine Shows How Good Idea Can Save on Equipment Costs



The long and short of this pointer is worth remembering the next time you have a problem like it.

Here, a Gisholt No. 4 Ram Type Turret Lathe, which has 25¾ inches from hexagon turret face to spindle, is handling a 46⅝-inch-long shaft. The seamless steel tubing is fed through the spindle and locates against stock stop "A" for simple turning, reaming, necking and threading operations. Then the hexagon turret is indexed so that stop "A" again faces the work. The stop is hinged and flips up, permitting the bar stock to pass completely through the turret and locate against stop "B." The body of stop "A" acts as a steady-rest to prevent whip while the shaft is cut off to length from the rear tool post on the cross slide. Stop "B" then also swings out of the way for easy removal of the finished shaft. The whole job takes only 2.75 minutes floor-to-floor.

By simply allowing the workpiece to pass through the hexagon turret, a shaft nearly twice the length of the machine's capacity can be handled—sparing the need for a larger, more costly lathe.

TURRET-MOUNTED LOADER SPEEDS CHUCKING

Gisholt Fastermatic Automatic Turret Lathe uses Loading Arbor to Save Time and Effort.

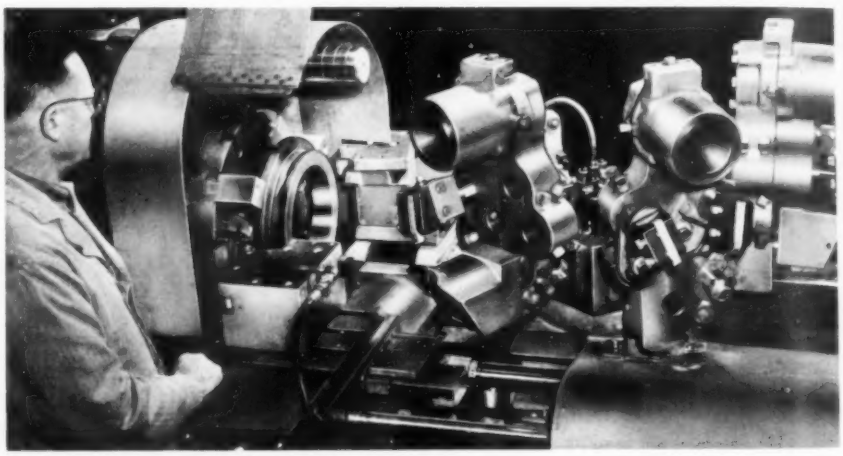
Even if you have your machining time down pat, you may still be able to cut over-all time further with a better loading method.

Here, to simplify and speed up chucking operations, this 2F Fastermatic has a special turret-mounted loader arrangement. As each machine cycle ends, the finished part is removed. Then forward movement of the hexagon turret carriage brings a rough workpiece on the loading arbor to the chuck. Spring-loaded studs on the arbor force the piece against the chuck jacks to locate the work.

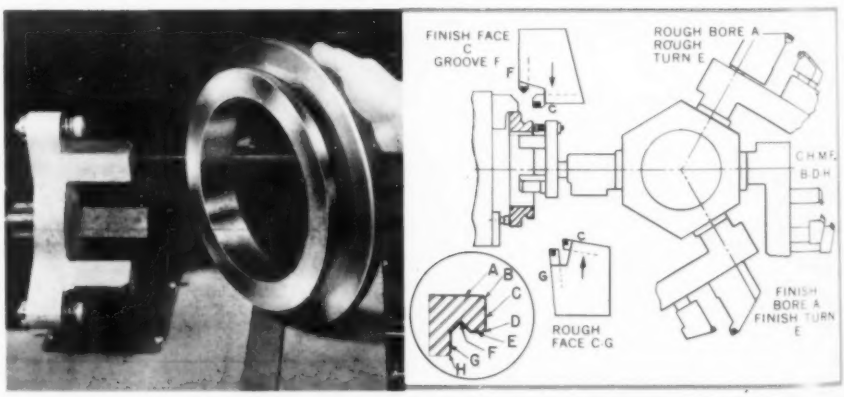
With simplified loading and chucking and a fully automatic machine cycle, time is just 6.9 minutes f.t.f.

The hexagon turret stations are tooled to turn, bore and chamfer with all facing and grooving operations on the steel rings performed from the front and rear cross slides.

Using a loading arbor on one turret face of the Fastermatic Automatic Turret Lathe reduces manual effort and simplifies chucking.



Tooling setup for first operation machining on steel rings.



Here's the special turret-mounted loader. Also a finished part showing surfaces machined.

GISHOLT

TIME-SAVING IDEAS

AUTOMATIC LATHE DOUBLES AT SUPERFINISHING AND BEARINGIZING

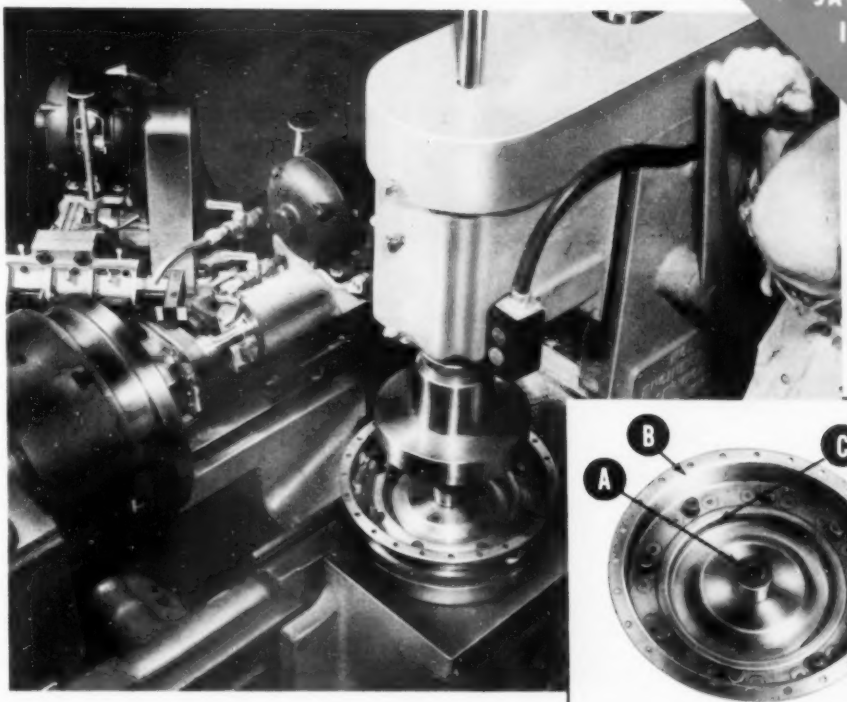
Gisholt No. 12 Hydraulic Lathe Adapts for Special Work

For many of those special jobs that come along present equipment can lend a hand. This unique application of a Gisholt No. 12 Hydraulic Lathe, where three jobs are performed in one handling, is a good case in point.

Here, it is specially tooled to finish automotive transmission converter clutch housing and bushing assemblies. Two No. 1 Superfinishing attachments are mounted on the rear independent slide. One Superfinishes the flat hub face (A) of clutch housing for thrust washer contact. At the same time the 45-degree sealing face (B) is also Superfinished.

While this part is being Superfinished, the preceding workpiece has its 8-inch bore (C) sized and finished by a vertical Bearingizer unit, also mounted on the No. 12 Hydraulic Lathe.

Production is fast—over 50 parts per hour. Tolerances are closely held and the required "controlled" surface finish readings easily obtained.



By simple adaptation, this No. 12 Hydraulic Automatic Lathe performs as a special machine to produce Superfinished and Bearingized parts.

To show tooling, Superfinishing quills are withdrawn, Bearingizer unit is raised. While part is Superfinished, another is Bearingized.

THREAD-GRINDING WHEELS BALANCED FOR MORE PRECISE WORK

Gisholt DYNETRIC Balancer Measures, Locates Unbalance to Eliminate Harmful Vibration

Thread-grinding wheels operate at high speeds and therefore must be very accurately balanced to eliminate vibration which would hamper grinding to close tolerances. For this type of workpiece, where the length along the axis is small compared to the diameter, correction is usually made only for force (static) unbalance.

For fast, simple, low-cost balancing this Gisholt Type 3S DYNETRIC Balancing Machine is used. It is easily set up to measure and locate force unbalance. The strobe lamp flashes on the numbered band and indicates which of the tapped holes provided in the mounting flange plate will receive the correction weight. At the same time, the amount meter tells the operator exactly which weight screw is to be added to bring the part into precise balance.

By eliminating vibration, grinding wheels rotate very smoothly and produce better threads to closer tolerances.

Balancing, performed on new wheels and after dressing old wheels, assures accuracy and improves performance.

DYNETRIC BALANCERS GISHOLT

Complete courses covering all phases of precision balancing are offered by the *Gisholt Balancing School*. Get details and starting dates.

For A Clear Picture . . .

of the various plans under which you can acquire new machine tools, you'll find this a very helpful booklet. It explains and illustrates time-buying and leasing methods to show how you can benefit from these methods. Write for Booklet P-1173.

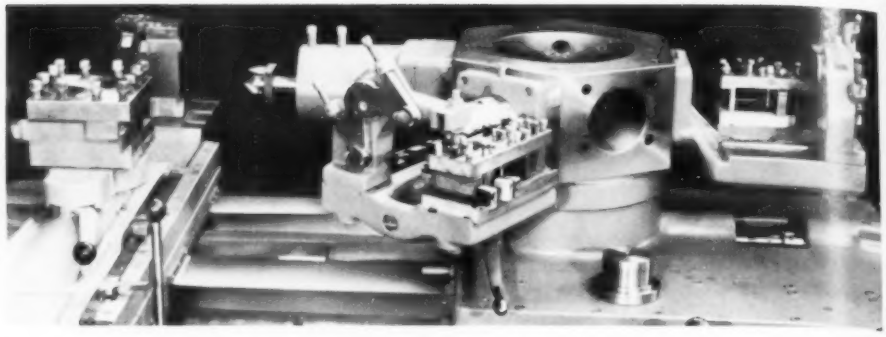
GISHOLT

GISHOLT

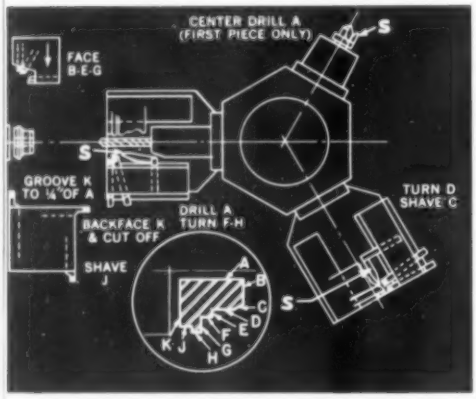
TIME-SAVING IDEAS

MULTIPLE TOOLING ANSWERS SMALL LOT PRODUCTION

This tooling arrangement makes an ideal setup for the various machining operations shown in the layout. As few as five pieces per lot are handled economically this way.



Saddle Type Lathe Produces Coupling Hubs Faster, More Accurately



Here a standard Gisholt 3L Saddle Type Turret Lathe is multiple tooled with lots as few as five pieces handled economically. The lathe is equipped with a bridge-type cross slide and is tooled to machine steel flexible coupling hubs from bar stock.

All tooling for the several different sized parts is pre-set. This includes the group of tools on the rear of the cross slide and also the special tool blocks held in the multiple cutter turners on the hexagon turret. To go from one part size to another, the operator merely changes these special tool blocks and adjusts the multiple cutter turner rollers. Special stops "S" on turret tooling determine the length of all turned diameters and shoulder positions directly from the end of the piece. These stops eliminate the time required to set turret stops. Also, a stock stop to position the work prior to starting machining operations is not required.

With this kind of interchangeable pre-set tooling on Saddle Type Turret Lathe, you have a high-production setup which can be used for small lots.

HOW SPOT CHECKING SAVES TIME ON SUPERFINISHING JOBS

Inspection Equipment on Machine Speeds Small Lot Operations

Operator is checking surface finish reading with inspection equipment mounted on Gisholt 51A Superfinisher.

Superfinishing, as you may know, is the process whereby a "controlled" surface finish can be quickly and economically obtained, piece after piece—whether the specified final finish is 50, 30, 10 or 1 micro-inch RMS.

In small job shop operations, various parts are handled and finish requirements vary considerably. This necessitates some means by which the operator can determine when he has produced the specified surface finish on a part.

This standard Gisholt 51A Superfinishing Machine is equipped with a Profilometer Unit. This provides a means of instant checking the surface roughness of the part being Superfinished at any time during the Superfinishing operation. The part doesn't have to be removed. It's possible to Superfinish each individual part to the blueprint tolerance before leaving the machine.

Superfinishing is made even more efficient and lower cost with this means of keeping a "running" check on surface roughness. It's ideal for handling small lots and where different surface finishes are specified.

Write for book, "Wear and Surface Finish" which gives full information on Superfinish.

No. 5-655
639

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Another **PRODUCTION SOLUTION**

by

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Does the Job Best!

A variety of machining operations, unique in sequence, is combined on a new 15-station automatic transfer machine. Grouping standard machine tool units attains maximum production and utilizes automation. In addition, the M. & M. Triple-Chip circular saw cut-off makes possible the use of low cost stock material; increases your ultimate savings. Start by sending us your part drawings for a production solution by Motch & Merryweather.

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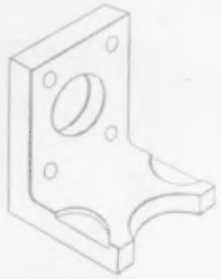
MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

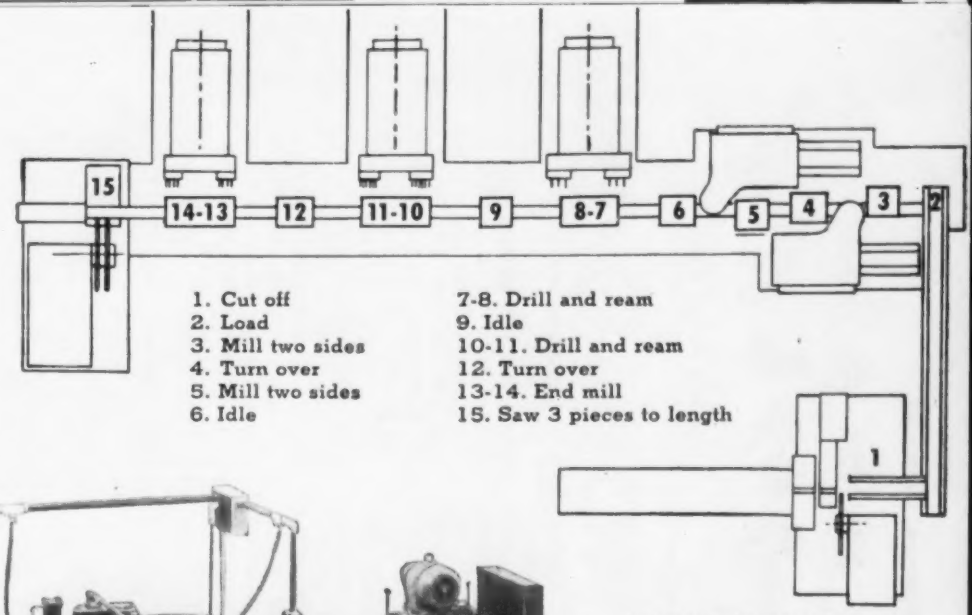
Builders of Circular Sawing Equipment,
Production Milling, Automatic and Special Machines



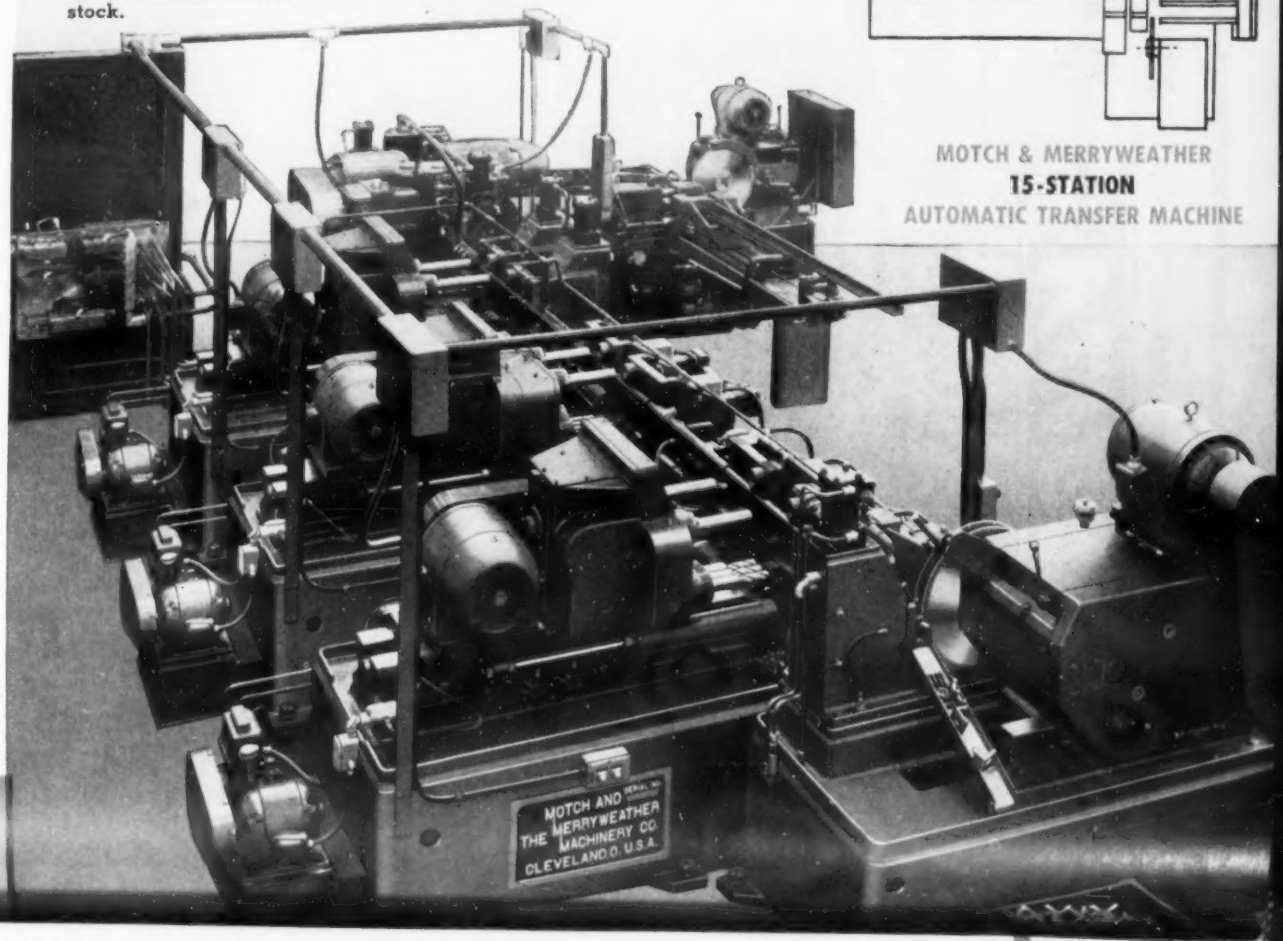
Part Name:
Cylinder bracket.

Production:
384 pieces per hour.

Material:
3" x 2½" x ½" angle iron, standard milled stock.



1. Cut off
2. Load
3. Mill two sides
4. Turn over
5. Mill two sides
6. Idle
7-8. Drill and ream
9. Idle
10-11. Drill and ream
12. Turn over
13-14. End mill
15. Saw 3 pieces to length



MOTCH & MERRYWEATHER
15-STATION
AUTOMATIC TRANSFER MACHINE

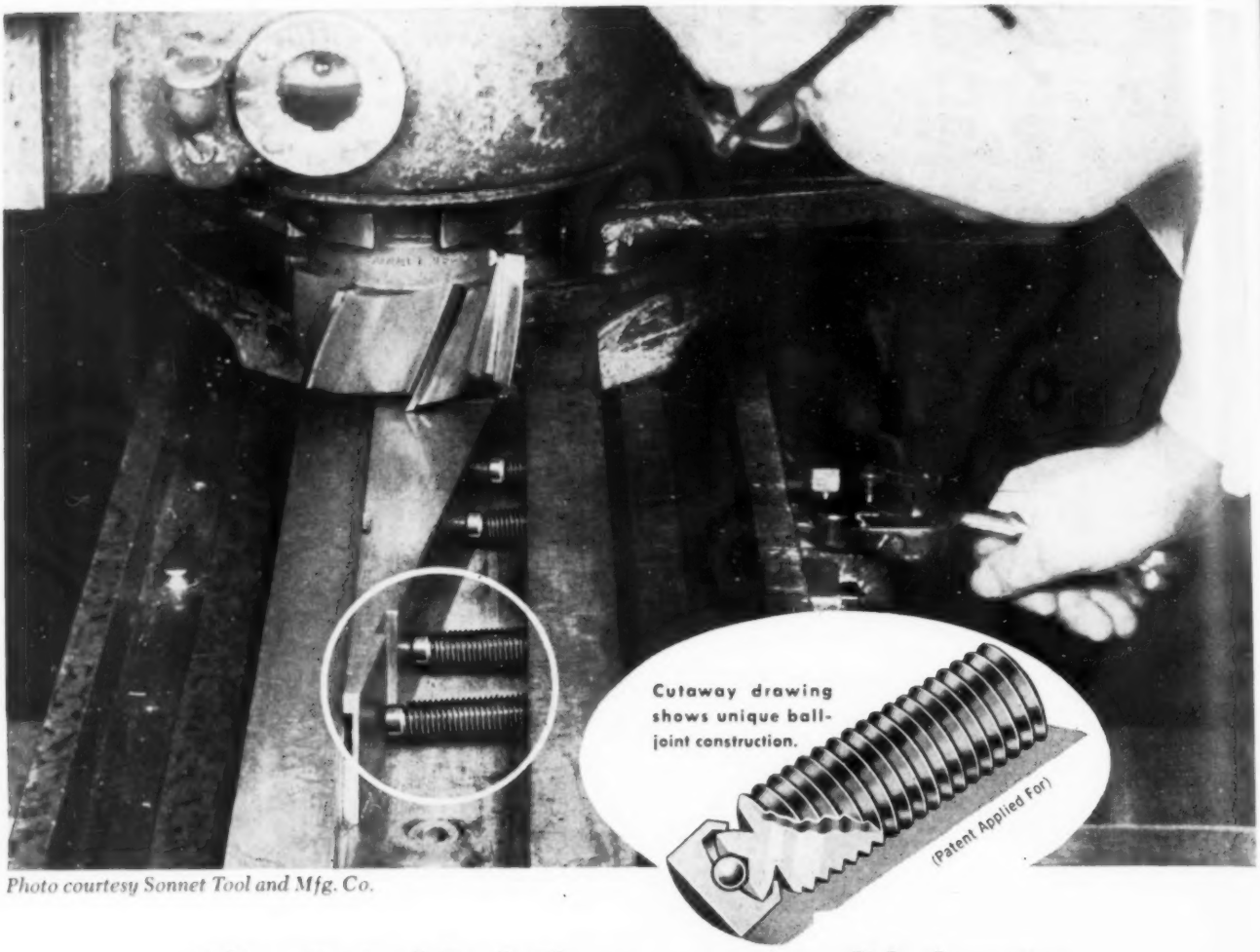


Photo courtesy Sonnet Tool and Mfg. Co.

Vlier Swivel-Pad Clamps assure solid clamping of parts in jigs and fixtures without marring their surfaces

Unique ball-joint construction prevents binding of the pad; assures automatic adjustment to off-angle surfaces

The mill fixture shown above demonstrates the usefulness of Vlier Swivel-Pad Clamps. Four Swivel-Pads are used to clamp the part rigidly in the fixture for the milling operation. Maximum rigidity is imperative in this setup if the high efficiency of the Sonnet "Helicarb" Shell-End Mill is fully utilized.

First touch of the pad against the work piece adjusts the pad face to the surface of the part and stops pad rotation. Extreme clamping pressure can then be applied to the part without damage, since screw torque is taken up by the pad, not the part. Swiveling the pad on a ball eliminates binding and assures frictionless adjustment to off-angle surfaces up to 7½ degrees each side of the center line.

Uniform clamping pressure

Design of the ball-joint causes the clamping force to be distributed equally to every point on the pad face. The pad is machined from solid stock for greater strength. The face of the pad is ground flat, not counterbored or relieved, for maximum holding surface.

Insert from either end

Since the pad diameter is less than the body diameter Swivel-Pads can be inserted in the jig or fixture from either end. This feature is especially helpful where space is limited.

Use it again and again

The body of the Swivel-Pad is made from heat-treated, alloy steel for high strength and long life. A special rust-proof finish prevents the tool from freezing in the jig or fixture.

Eliminate costly makeshift devices

These simple holding tools can save *your* tool room hundreds of dollars every year. Having them available eliminates costly machining of home-made devices and speeds tool manufacture and setups. Swivel-Pads are now available in 23 diameters and lengths. Call your Vlier distributor now and order an assortment of sizes.

Write for your free copy of the new 1955 Vlier Catalog

Other Vlier Tooling Specialties

TORQUE THUMB SCREWS | SPRING PLUNGERS | TOGGLE PADS | SPRING STOPS | FIXTURE KEYS

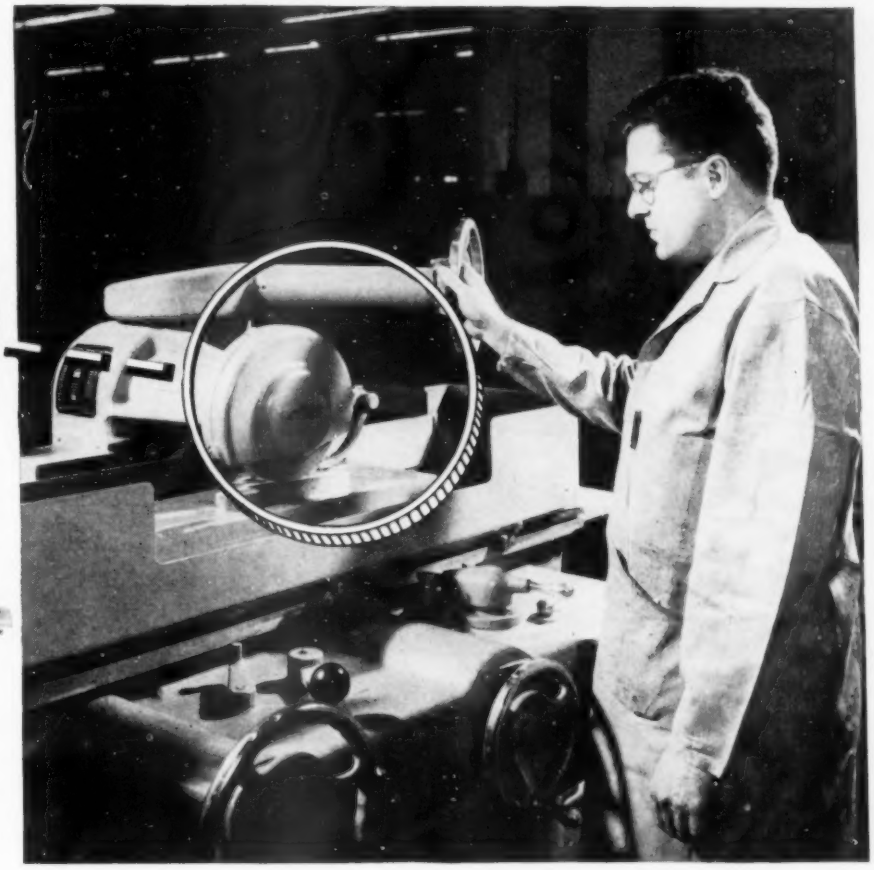
VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

Easy to set up... Easy to operate...

This Norton 8" Surface Grinder

saves on production and tool room jobs



Here's a rugged machine that sets up quickly for production runs and maintains steady accuracy on small parts. And it's just as efficient for grinding a variety of small units in tool room work.

Designed with both hand and hydraulic table traverse and cross feed, the Norton 8" x 24" hydraulic surface grinder produces plane surfaces smoothly and speedily. Convenient controls and easy accessibility keep operating and maintenance time low — while the quick, easy set-ups cut your unit costs on job after job.

Write for Catalog 190 on this popular, money-saving Norton surface grinder, or for literature on its 6" and 10" companion models. And remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass.

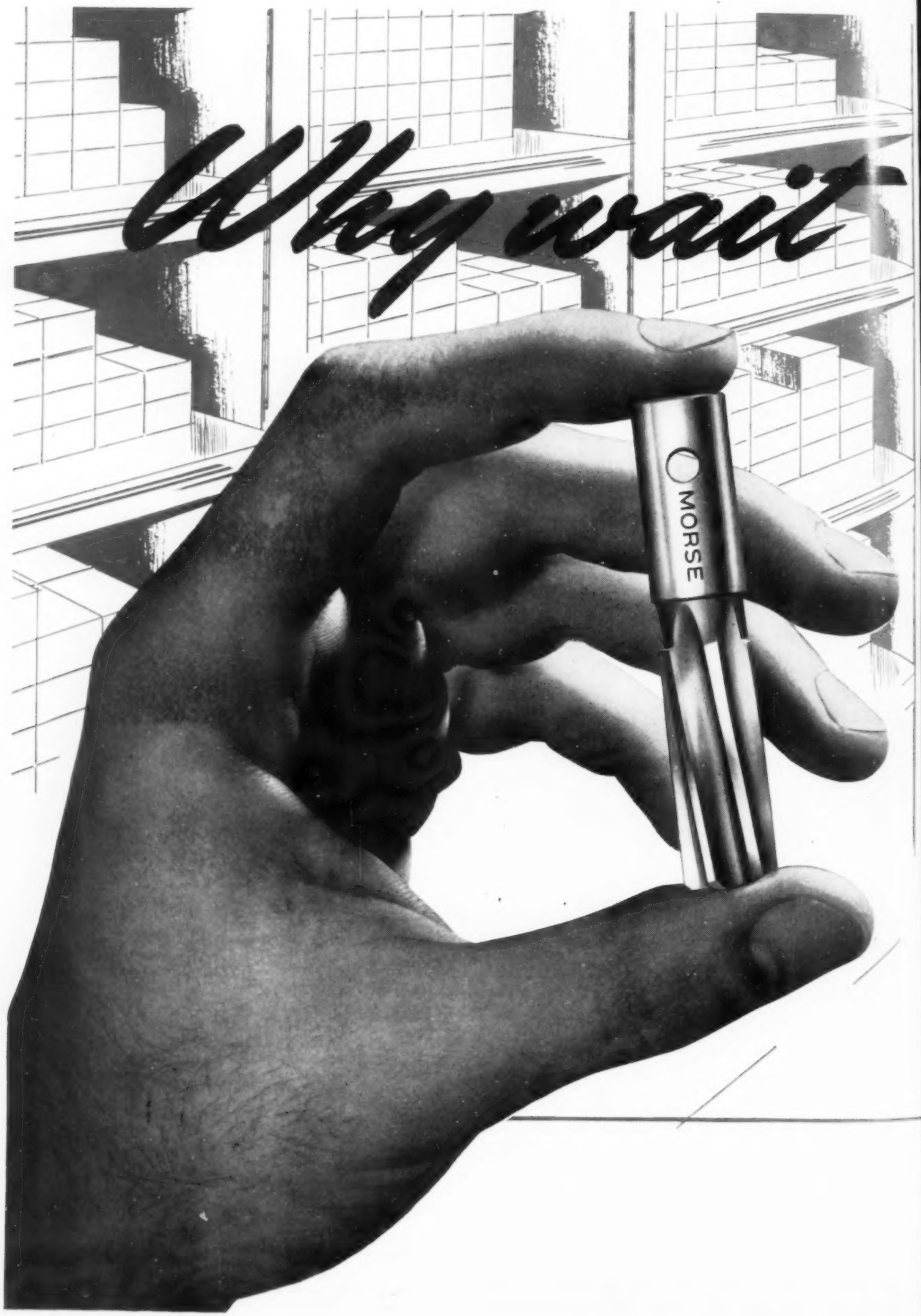
***To Economize, Modernize With* NEW**

NORTON

GRINDERS and LAPPERS

Making better products . . . to make your products better

District Sales Offices: Worcester • Hartford
New York • Cleveland • Chicago • Detroit


Why wait
MORSE

Tomorrow for Screw Machine Reamers when MORSE can ship them TODAY?

That's right! Morse is set up to give you immediate delivery on Stub Screw Machine Reamers in any size ranging from .060″ through 1″. This is typical of the many services that your Morse Franchised Distributor can offer you on all your cutting tool needs. He's the only man that can offer you the many Morse exclusives including Electrolized tools and Vectormatic ground taps.

Your Morse Franchised Distributor is your only source of "production insurance" . . . he's got the know-how and the stock to start you toward better work and savings than you ever expected. *Call him today!* He'll give you your first saving (in time) right now.

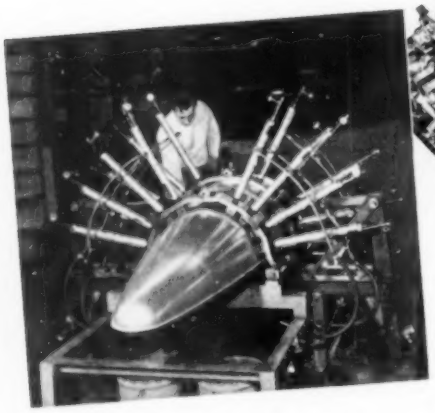
THE MORSE CODE MEANS 100% DISTRIBUTOR PROTECTION . . . **on all**

MORSE
Cutting Tools

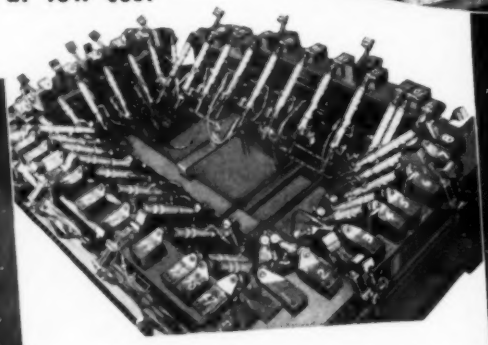
MULTIPLE DRILLING WITH KELLER "Airfeedrills"

Low investment and easy change-over make Airfeedrill setups the ideal way to make accurate holes at low cost

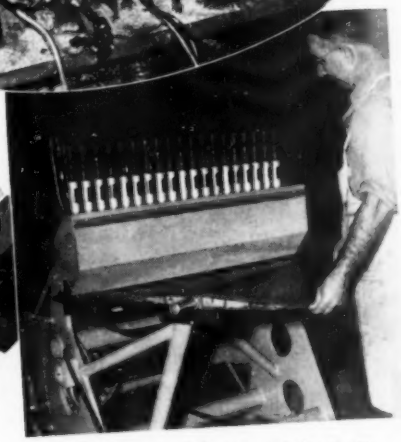
Eight Airfeedrills (four with dual spindles) drill 12 holes in 24ST aluminum part



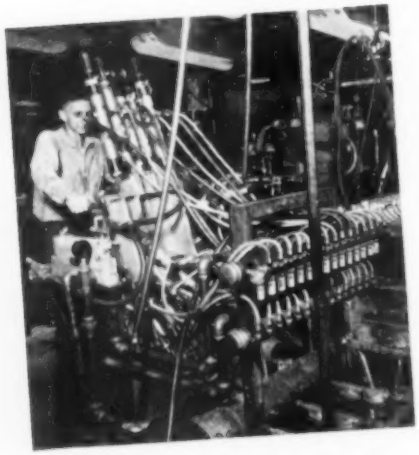
Sixteen holes made simultaneously on teardrop gas tank. Note the drilling angles



47 Airfeedrills on a single fixture for making trim holes in automobile roof panels



Fixture with 19 Airfeedrills used on guided missile fins at an aircraft plant



Fixture with 16 Airfeedrills used on section of automobile instrument panel

Here is the new way to handle multiple drilling jobs without investing in expensive machine tools. Simply build a fixture on which to mount Keller Airfeedrills . . . connect them with your air supply . . . and you are in business.

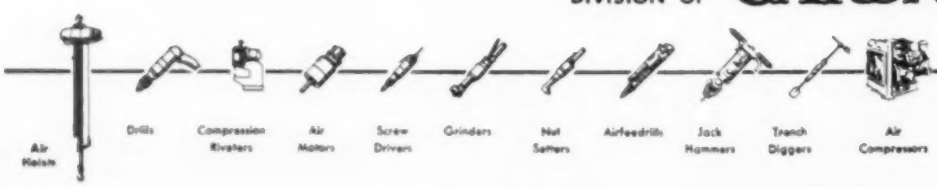
When the job has been run, the Airfeedrills are detached for use on another job. Where jobs are intermittent or short run, Airfeedrills permit high production where no other multiple drilling method would be economically feasible.

If you are not acquainted with the remarkable possibilities of Keller Airfeedrills, send for information without delay. Ask for Catalog Sections 92 and 92A.

KELLER "Airfeedrills"

KELLER TOOL

DIVISION OF **GARDNER-DENVER**



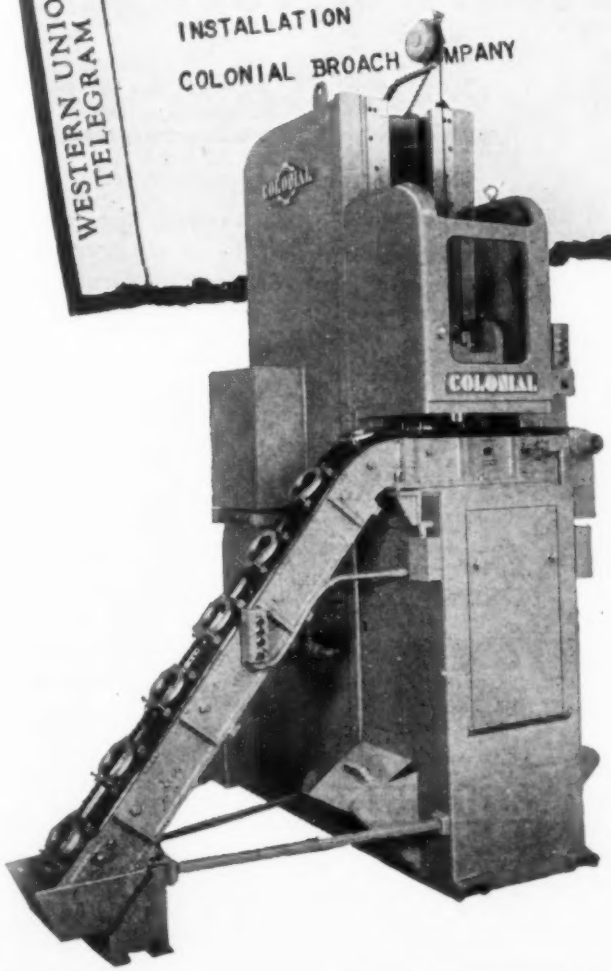
1311 Fulton Street
Grand Haven, Michigan

WESTERN UNION TELEGRAM

CMC 6 WUX MARCH 9 1955 2:05PM

EVERY 12 SECONDS INSIDE DIAMETER ON A DIFFERENTIAL RING GEAR IS BROACHED TO CLOSE LIMITS ON THIS AUTOMATED SETUP 100 PER CENT EFFICIENCY GIVES A PRODUCTION OF 300 PER HOUR OPERATOR LOADS CONVEYOR FROM FLOOR WITH FOUR STATIONS IN EASY REACH GRAVITY UNLOADS BROACHED RING GEAR BLANKS REPEATING 12 SECOND CYCLE IS (1) PULL-UP WORK STROKE (2) INDEX TO RETURN POSITION (3) RETURN STROKE (4) INDEX TO BROACHING POSITION CONTROLS ARE COMPLETELY SAFETY INTERLOCKED REQUEST BULLETIN RU-54 FOR SPECIFICATIONS ON STANDARD 15-TON 48-INCH STROKE COLONIAL PULL-UP MACHINE IN THIS UNIFIED BROACHING INSTALLATION

COLONIAL BROACH COMPANY



every 12 seconds!

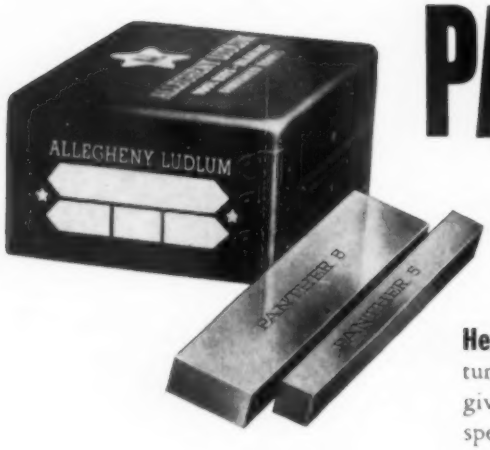
PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

UNIFIED BROACHING is the key to successful broaching

TRY and COMPARE



PANTHER 5 TOOL BITS FOR YOURSELF

Here's what you GET in Panther 5 . . . A high-carbon, high-vanadium, tungsten-bearing high speed steel with 5% cobalt. Its analysis is designed to give this grade the highest red-hardness and abrasion-resistance of *any* high speed steel.

Here's how it can HELP you . . . This combination of highly valuable properties gives Panther 5 exceptional ability to resist wear, yet it also possesses good toughness and edge strength. Put Panther 5 Tool Bits on your heavy-duty jobs and abrasive materials—*watch them step up your production runs between grinds!*

Stocked in ALL SIZES . . . Panther 5 Tool Bits are produced as a finish-ground product. They're carried in stock for immediate shipment in nine sizes of squares, from ¼″ x 2½″ long to 1″ x 7″ long . . . and in eighteen sizes of flats, ranging from ⅜″ x ¼″ x 3″ long to 1½″ x ¾″ x 7″ long. ● *Why not get in a trial order—see for yourself what they'll do!* Check your nearest AL representative or distributor . . . or write ***Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.***

Valuable Data for PRODUCTION MEN ... yours for the asking

1. **"HIGH SPEED TOOL BITS"**
   Handy data on the complete AL line, comprising eight different grades of high speed steel tool bits. Includes shop handling, heat treat methods, etc.

2. **"CUTTING TOOL MATERIALS"**
   This 36-page booklet analyzes and compares all AL grades of cutting tools: carbon and high speed steel, cast alloy and carbides. Includes data on handling and treatment.

ADDRESS DEPT. TE-66

For complete **MODERN** Tooling, call

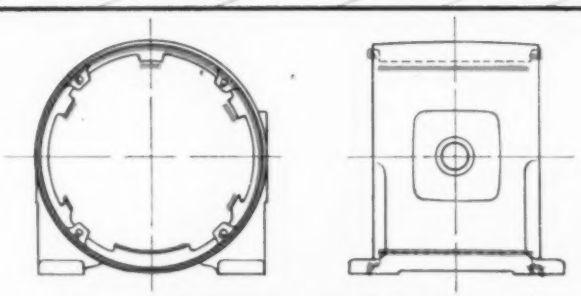
Allegheny Ludlum

W&D 5864

AL® FINE TOOL STEELS SINCE 1854

PROBLEM

1. lower stator frame machining costs.
2. increase production and accuracy
3. run any one of four different size parts



MACHINING NECESSARY

Drill 8 holes	Bore two inside diameters
Chamfer 8 holes	Rough face ends
Tap 8 holes	Remove chips

for problems in Drilling, Boring, Facing and Tapping

Call a Natco Field Engineer

CHICAGO, Room 203, 6429 W. North Ave., Oak Park
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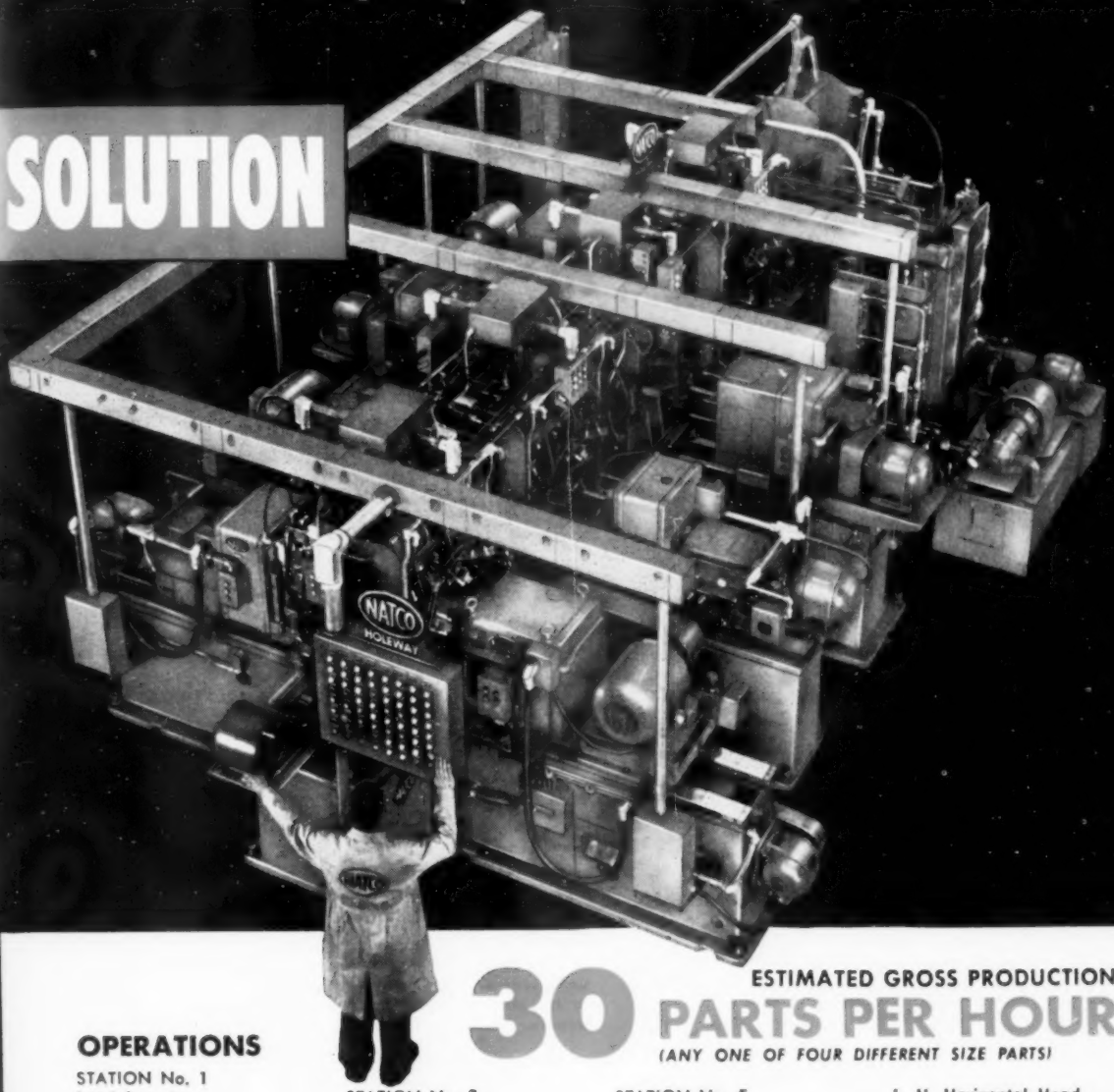
WIEDEMANN

NEW NATCO HOLEWAY

cuts costs and increases production . . . and accuracy by combining operations!

SOLUTION



ESTIMATED GROSS PRODUCTION

30 PARTS PER HOUR

(ANY ONE OF FOUR DIFFERENT SIZE PARTS)

OPERATIONS

STATION No. 1
Load 1 part.
STATION No. 2
R. H. Horizontal Head
Combination rough bore for 10.492/10.490 half thru, rough bore for 12.064/-12.062 diameter, finish bore 10.520/10.510 diameter and rough face end.
L. H. Horizontal Head
Drill 4 holes

STATION No. 3
Idle
STATION No. 4
R. H. Horizontal Head
Drill 4 holes
L. H. Horizontal Head
Combination rough bore for 10.492/10.490 diameter rough bore for 12.064/12.-062 diameter and rough face end.

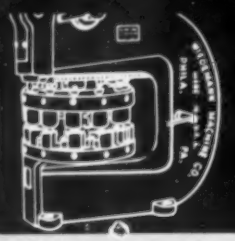
STATION No. 5
Idle
STATION No. 6
R. H. Horizontal Head
Tap 4 holes
L. H. Horizontal Head
Tap 4 holes
STATION No. 7
Idle
STATION No. 8
R. H. Horizontal Head
Idle

L. H. Horizontal Head
Finish bore to 10.492/10.490 diameter thru.
STATION No. 9
Blow chips out of center bore and 8 tapped holes (4 each side) and blow chips off top.
STATION No. 10
Unload 1 part. Part to be unloaded onto gravity conveyor.

NATIONAL AUTOMATIC TOOL COMPANY, INC.

RICHMOND, INDIANA

NATCO



WIEDEMANN in SHORT RUN

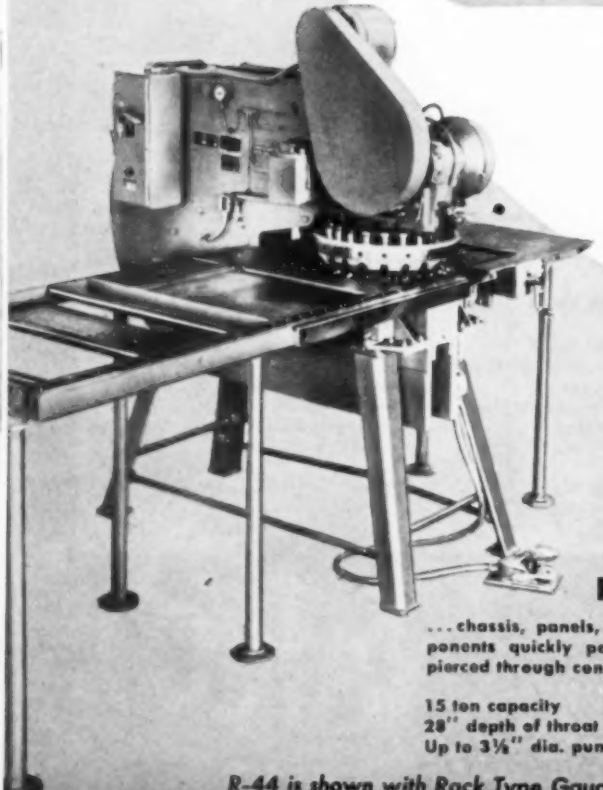
WIEDEMANN combines in ONE machine

1. the speed of a punch press
2. turrets carrying 12 to 32 punches and dies
3. a quick-setting, mechanical work positioning gauge

WIEDEMANN Cuts Piercing Costs 60% to 90%

- **ELIMINATES SETUP** — Necessary punches and dies are carried in turrets . . . any tool is rotated to piercing position in 3 to 5 seconds.
- **ELIMINATES LAYOUT** — Material to be punched is rapidly and accurately positioned with a Wiedemann work locating gauge.
- **UNLIMITED FLEXIBILITY** — Punches and dies of any shape and size can be used within the capacity of the press. A variety of openings can be made with the same punch and die.

Send drawings of your work for both time studies and recommendations on the Wiedemann Turret Punch Press and tools best suited for your needs. Every Wiedemann press is shipped completely tooled, ready to produce when leveled and connected to a power line.



R-44

. . . chassis, panels, and other flat metal components quickly positioned with a gauge or pierced through conventional templates.

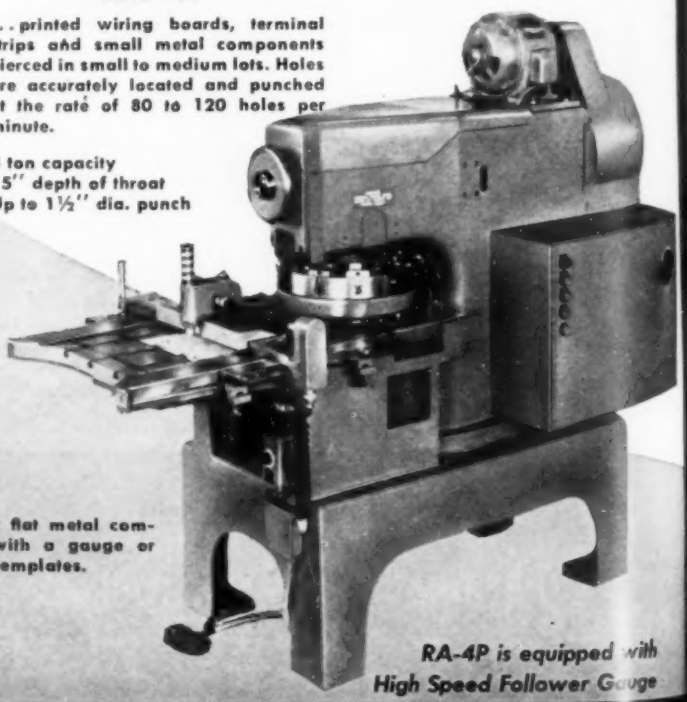
15 ton capacity
28" depth of throat
Up to 3⅛" dia. punch

R-44 is shown with Rack Type Gauge

RA-4P

. . . printed wiring boards, terminal strips and small metal components pierced in small to medium lots. Holes are accurately located and punched at the rate of 80 to 120 holes per minute.

4 ton capacity
15" depth of throat
Up to 1½" dia. punch



RA-4P is equipped with High Speed Follower Gauge

WIEDEMANN

N IS THE ULTIMATE
IN PIERCING ECONOMY

SEE 8 WIEDEMANNS in OPERATION at BOOTH 1420

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

R-61

...radar chassis, switchgear, aircraft components, industrial refrigeration equipment... these are typical of the wide variety of work pierced on this versatile press.

40 ton capacity
33" depth of throat
Up to 6" dia. punch

R-61 is shown with Drop Latch Gauge

A WIEDEMANN *Pays for Itself in 2 Years or Less*

Literature on any of these Wiedemann Presses will be sent upon request.

RA-41P

...high speed piercing of electronic chassis, panels, components and similar work.

15 ton capacity
28" depth of throat
Up to 3½" dia. punch

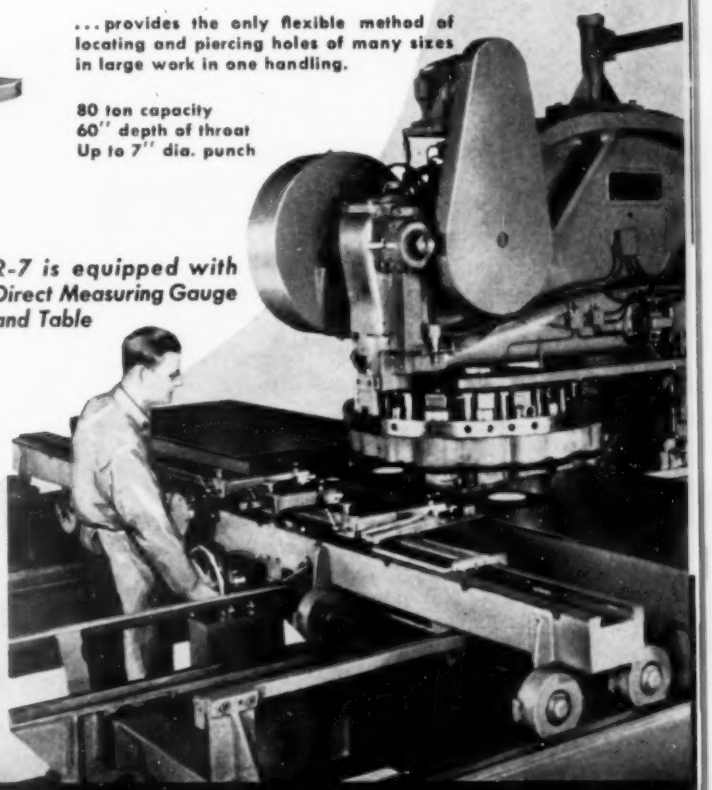
RA-41P is equipped with High Speed Follower Gauge

R-7

...provides the only flexible method of locating and piercing holes of many sizes in large work in one handling.

80 ton capacity
60" depth of throat
Up to 7" dia. punch

R-7 is equipped with Direct Measuring Gauge and Table



N MACHINE CO.

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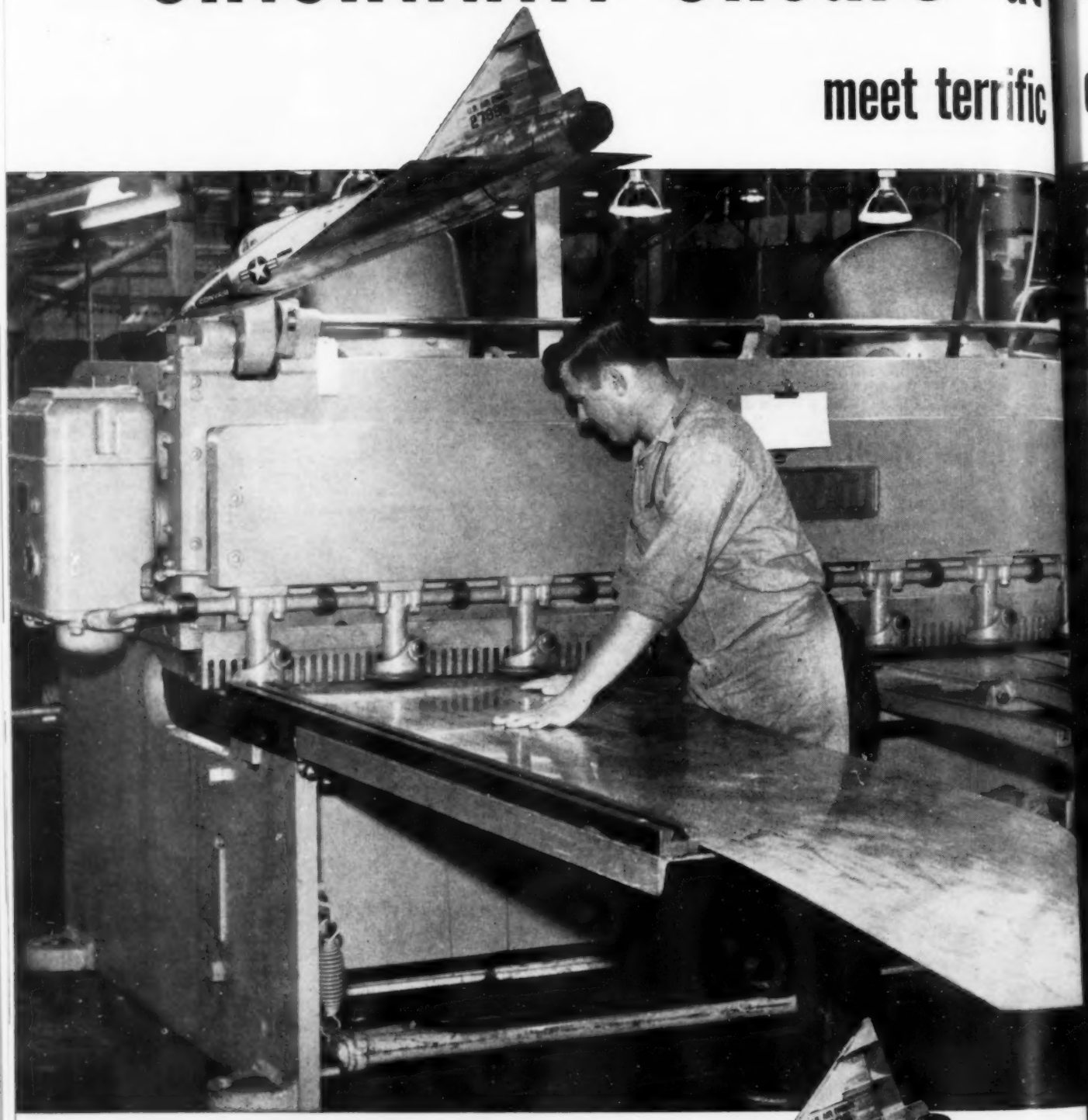
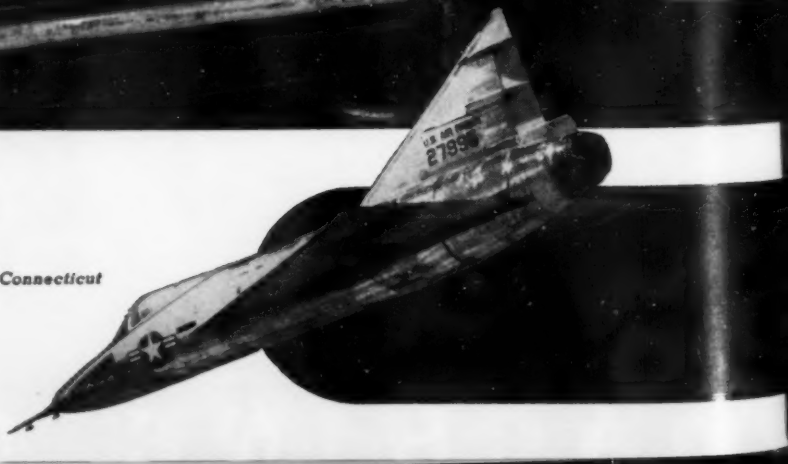
meet terrific





Materials being sheared in these illustrations are .093 Nimonic and .050" 5510 stainless steel.

Photos courtesy Pratt & Whitney Aircraft, East Hartford, Connecticut and Convair, San Diego, California.

PRATT & WHITNEY AIRCRAFT

demand for jet aircraft engines . . .

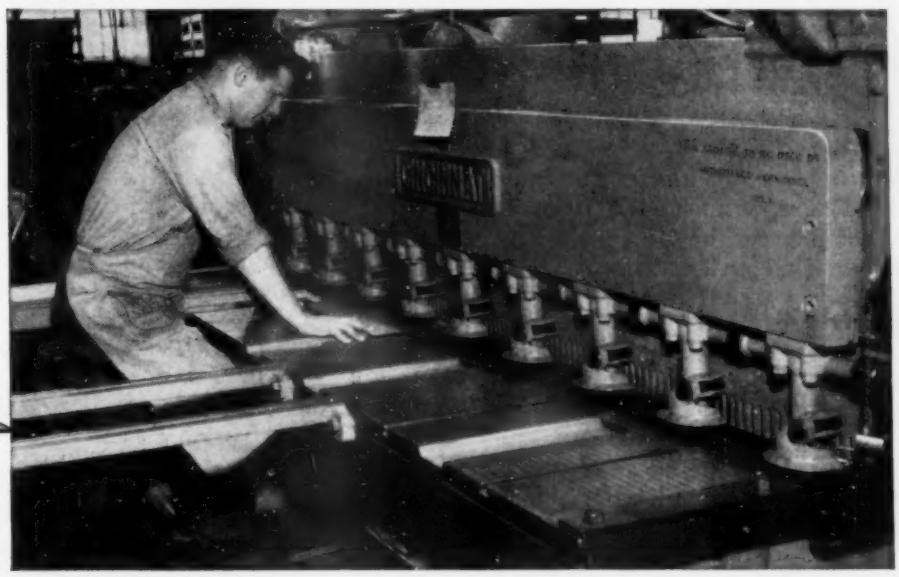
The right tools for the job were needed at Pratt & Whitney Aircraft, in their tremendous expansion, in the production of the highest power turbojets.

Cincinnati Shears are used in this program. Their accurate performance and ability to shear a wide variety of materials decided their selection.

Investigate:

- Cincinnati "Single Clearance" shearing
- Cincinnati Hydraulic Holddowns
- Cincinnati All-Steel Interlocked Construction

Write for complete Shear Catalogue S-6.



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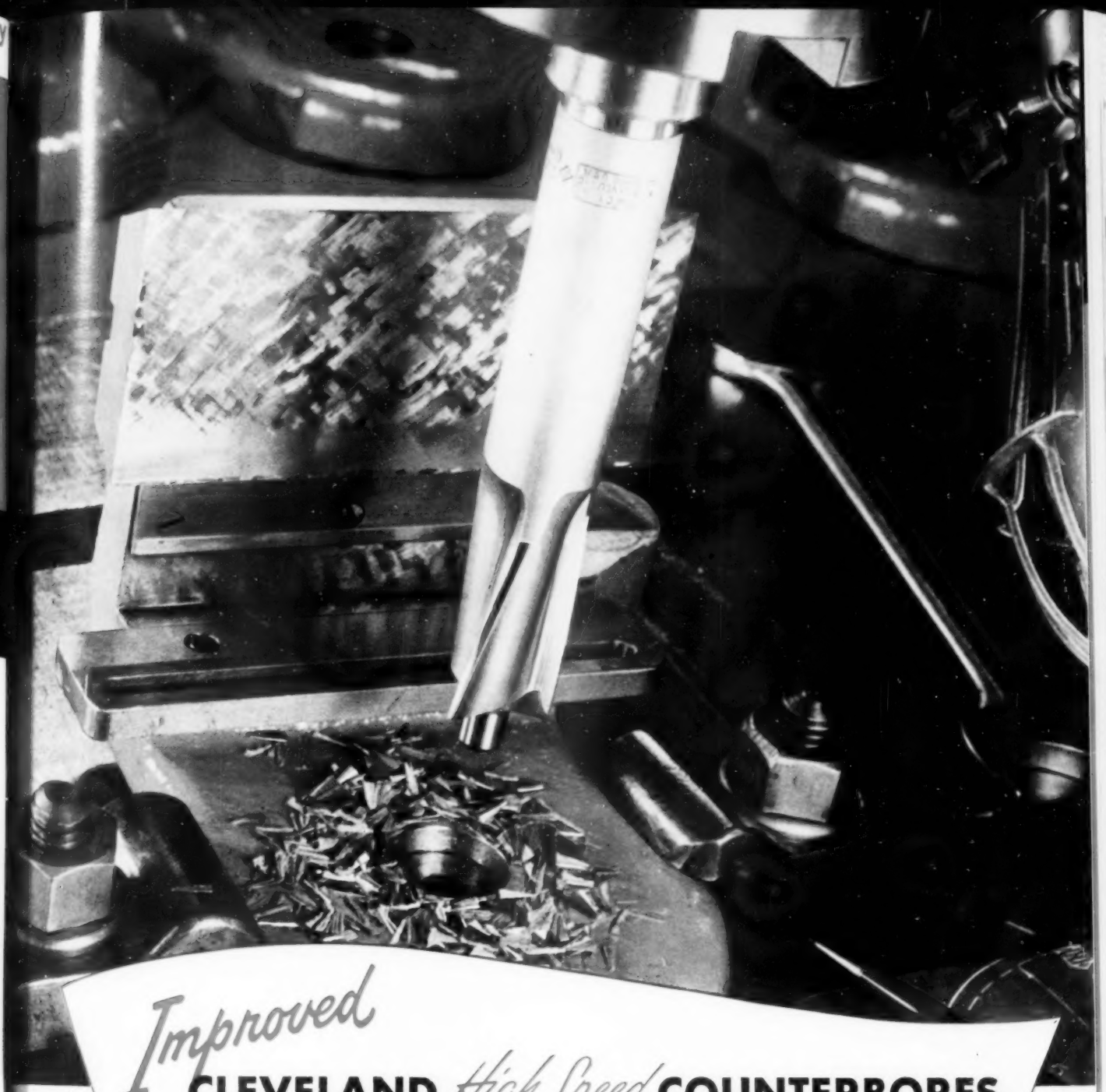
CINCINNATI



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New Flute Design for More Efficient Chip Removal

Deeper flutes eliminate "packing" of chips and reduce tool breakage . . . enable you to counterbore the full length of the flutes. This *superior tool* also gives you the *economy* of interchangeable pilots. It requires no holders or adapters. ◇ A test will prove the outstanding features of these improved CLEVELAND Counterbores.

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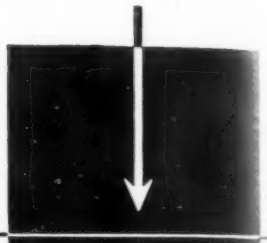
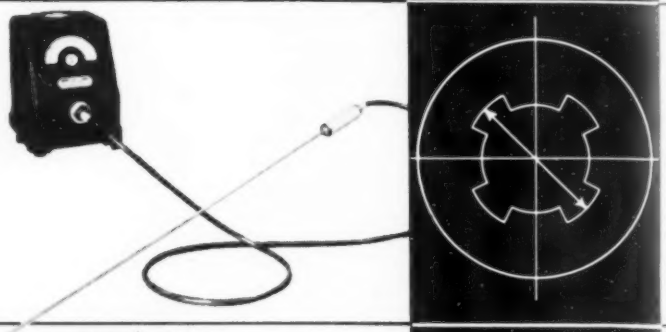
NUMBER THREE IN A SERIES

What's The Best Way To Gage These Parts ?

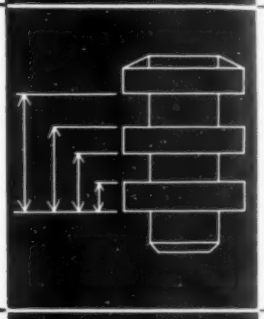
Tips from Taft-Peirce on when and where to use a T-P CompAIRator Air Gage





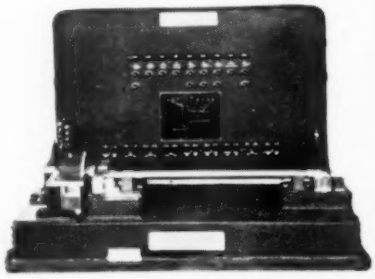
Helical Groove Diameter
Tolerance: .002″

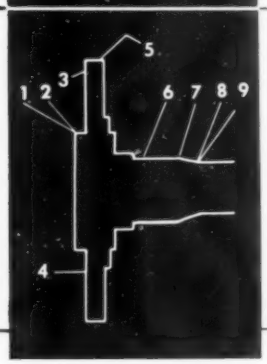
A single dial T-P CompAIRator Air Gage checks the helical rifling groove diameters in this 22 caliber rifle bore 32″ long. Gaging member slides in and out of bore, checks groove diameter at all points. Extremely sensitive yet sturdy — vibration, jarring, tilting won't disturb its accuracy.



Four Heights
Tolerance: .002″

One four dial T-P CompAIRator checks four land heights simultaneously on this spool valve. Tilted line-type dials facilitate reading. Pointer action is positive, instantaneous. CompAIRators can be designed to check any specific tolerance range from .0001″ to .125″.





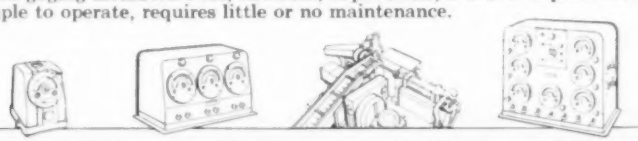
OD, Squareness, Runout, Concentricity
Tolerances: from .0005″ to .003″

This T-P CompAIRator combines air-electric, standard air, and computing air circuits to check 5 diameters, 2 runouts, one flatness, and one concentricity simultaneously on auto rear axles. Lights indicate dimensions out of tolerance. Exclusive T-P Computing CompAIRator circuits figure runout, flatness and concentricity. Eliminate usual four measurements and computations.

For more examples and the complete story on Taft-Peirce CompAIRator Air Gages send for Bulletin.

WHAT IS A COMPAIRATOR AIR GAGE?

A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.



STANDARD AND SPECIAL COMPAIRATORS | COMPUTING COMPAIRATORS | AUTOMATIC SORTING MACHINE | AIR ELECTRIC COMPAIRATORS

T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

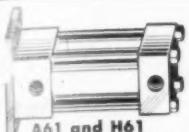
2000 Different Cylinder SELECTIONS—

Miller AIR AND HYDRAULIC CYLINDERS AND BOOSTERS "IN STOCK" for immediate delivery.

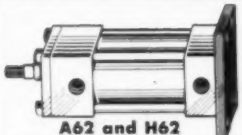
See Miller Bulletins A-105K (Air) and H-104K (Hydraulic) for Complete Dimensions and Engineering Data on these "in-stock" sizes and other Custom Miller Cylinders in bores up to 20" and strokes up to 22 feet.

"IN-STOCK" MODELS

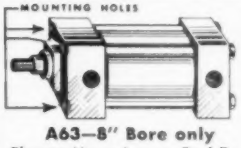
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown In Red On Drawings.



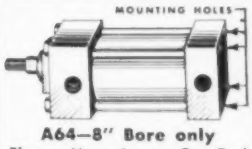
A61 and H61
Flange Mounting on Rod End
(A61 not available in 8" bore)



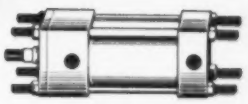
A62 and H62
Flange Mounting on Cap End
(A62 not available in 8" bore)



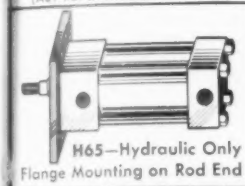
A63—8" Bore only
Flange Mounting on Rod End



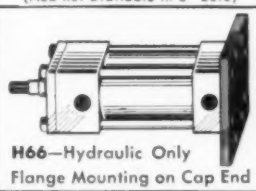
A64—8" Bore only
Flange Mounting on Cap End



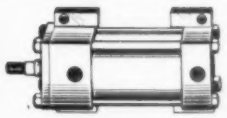
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.



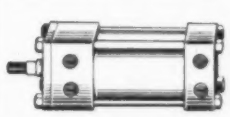
H65—Hydraulic Only
Flange Mounting on Rod End



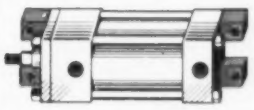
H66—Hydraulic Only
Flange Mounting on Cap End



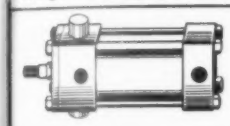
A72 and H72
Side Lug Mounting



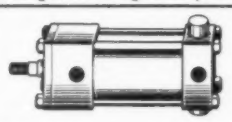
A74 and H74
Side Flush Mounting



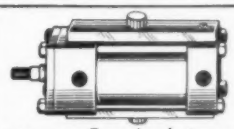
A77 and H77
Side or Foot Mounting



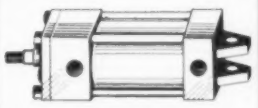
A81 and H81 Trunnion Mounting on Rod End



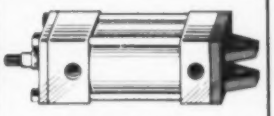
A82 and H82 Trunnion Mounting on Cap End



A83 and H83 Trunnion between Head and Cap
(one week delivery)



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

IN-STOCK BORES In Inches

"IN-STOCK" STROKES (in Inches)

	BORES	ROD DIA.	ROD TURN DOWN & THREADS		STROKES
AIR	1½	⅝"	7/16-20	Cushioned	3 4 5 6 7 8 9 10 11 12
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12
	2	⅝"	7/16-20	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	2½	⅝"	7/16-20	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	3¼	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	4	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	5	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	6	1⅜"	1-14	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	8	1⅜"	1-14	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
HYDRAULIC	1½	⅝"	7/16-20	Cushioned	3 4 5 6 7 8 9 10 11 12
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12
	2	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	2½	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	3¼	1⅜"	1-14	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	4	1¾"	1¼-12	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	5	2"	1½-12	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36

① "A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

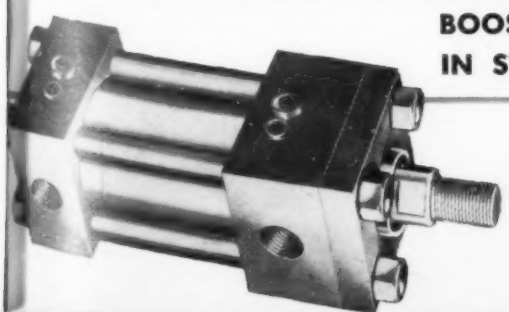
Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.



BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBA8, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.

Write For Catalog and Stock Price List

Miller

MILLER FLUID POWER CO.

2010 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

HARTFORD SPECIAL OFFERS FIRST

AN ANNOUNCEMENT

We are proud to announce our purchase of the complete line of "Delta-Milwaukee" Air Hydraulic Drill Units from the Rockwell Mfg. Company of Pittsburgh to complement our present line of mechanical and hydraulic, quill and way type units.

AN OBJECTIVE

To bring the benefits of automatic tooling methods within the reach of *every* manufacturer by making available standardized, low cost, well engineered machine components—drill units, tapping units, index tables, machine bases, mounting brackets and other accessories.

Check the Features of Controlled Power for Drilling, Tapping, Reaming, Spot-facing, Centering, Hollow Milling, Chamfering, Countersinking, etc.

POWER CONTROL THROUGH AIR-HYDRAULICS—Air, an excellent power source of stored energy, released as desired. Hydraulics, as positive a stop as steel, yet fluid for infinite control. ***The best qualities of both air and hydraulics are combined in the Hartford Air-Hydraulic Drill Unit.***

FULL REMOTE CONTROL—Built-in standard limit switches actuated at each end of spindle travel provide absolute electrical interlock with other units.

FLEXIBLE HYDRAULIC FEED CONTROL—Permits quick setting of any feed rate for maximum production consistent with tool life. No mechanical wear, no tool jump on breakthrough.

ABSOLUTE DEPTH CONTROL BY POSITIVE STOP—Micrometer control, adjustable within .001 inch. Holds depth to within .0005 inch.

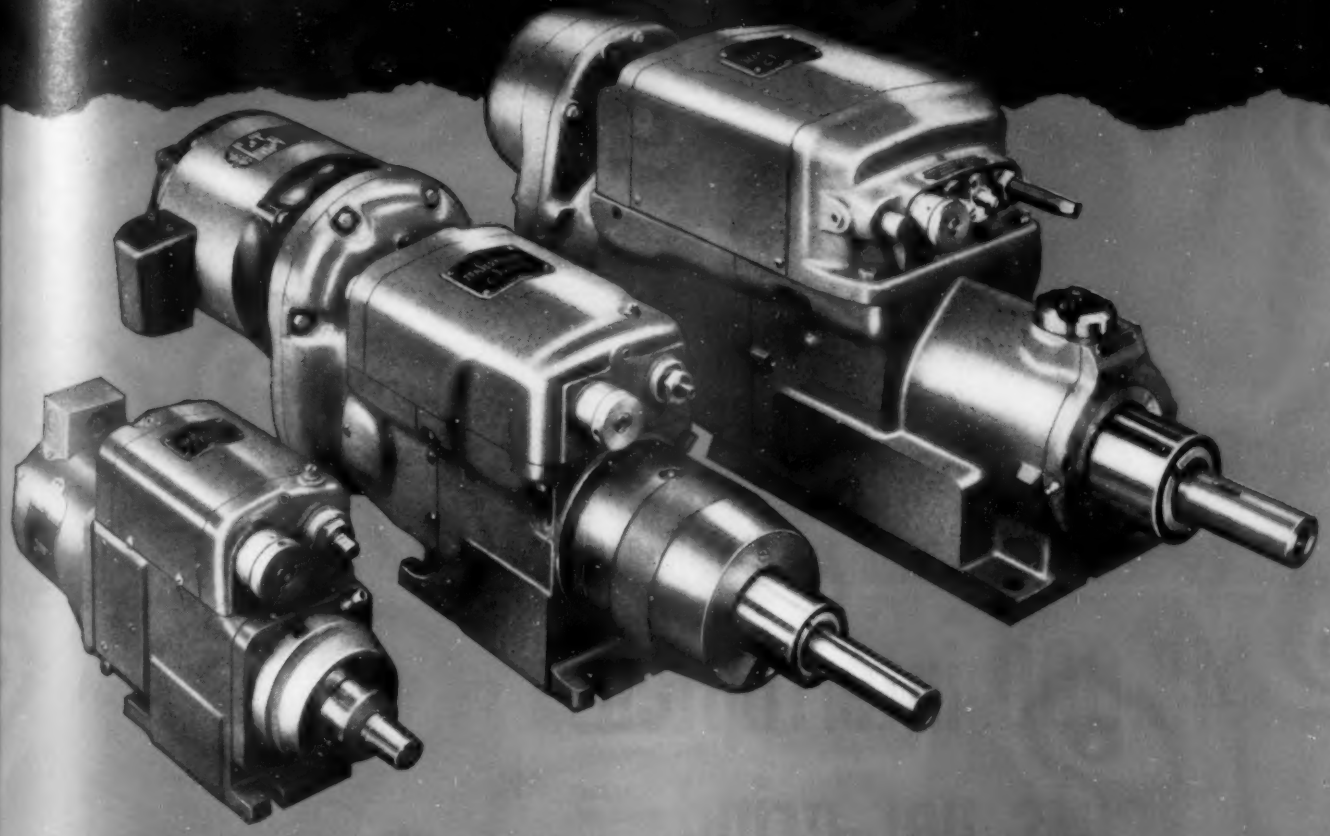
HIGH RAPID TRAVERSE, POSITIVE STOPS—Rapid approach and return at from 5 to 6 inches per second. Positive stop permits approach of tool to within .010" of work.

SEALED UNIT CONSTRUCTION—Permits mounting of unit in virtually any position without regard to lubrication or hydraulic reservoir.

HARTFORD *Special*

Machine Tool Division, THE HARTFORD SPECIAL MACHINERY CO.

ST *COMPLETE* DRILL UNIT LINE!



CONDENSED SPECS . . . 3 Models, 15 Drive Arrangements

Model No.	Drilling Capacity Mild Steel	Tapping Capacity Steel	Maximum Stroke	Horse Power	Spindle Speed Range	Feed Range	Rapid Approach Rate	Rapid Return Rate	Standard* Spindle Nose
19-150	5/16" dia.	5/8"	1½"	⅓ to ¾	300 rpm to 10,000 rpm	0-70 ipm	350 ipm	300 ipm	#2 Jacobs external taper
19-400	5/8" dia.	1"	4"	¾ to 2	100 rpm to 5,000 rpm	0-50 ipm	300 ipm	240 ipm	#2 Morse internal taper
19-600	1¼" dia.	2"	6"	1½ to 5	28 rpm to 3,450 rpm	0-180 ipm	Adj. to 300 ipm	Adj. to 240 ipm	#4 Morse internal taper

* Special spindles available on request.

If in your plant you drill, tap, ream, spot-face, center, hollow mill, chamfer or counter-sink and you want to cut costs, send for this catalog . . .

MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
280 Homestead Avenue
HARTFORD 12, CONN.

☐ Please send me new Drill Unit catalog, with application Data Sheet.

☐ Please have Field Engineer call.

Name _____ Pos. _____

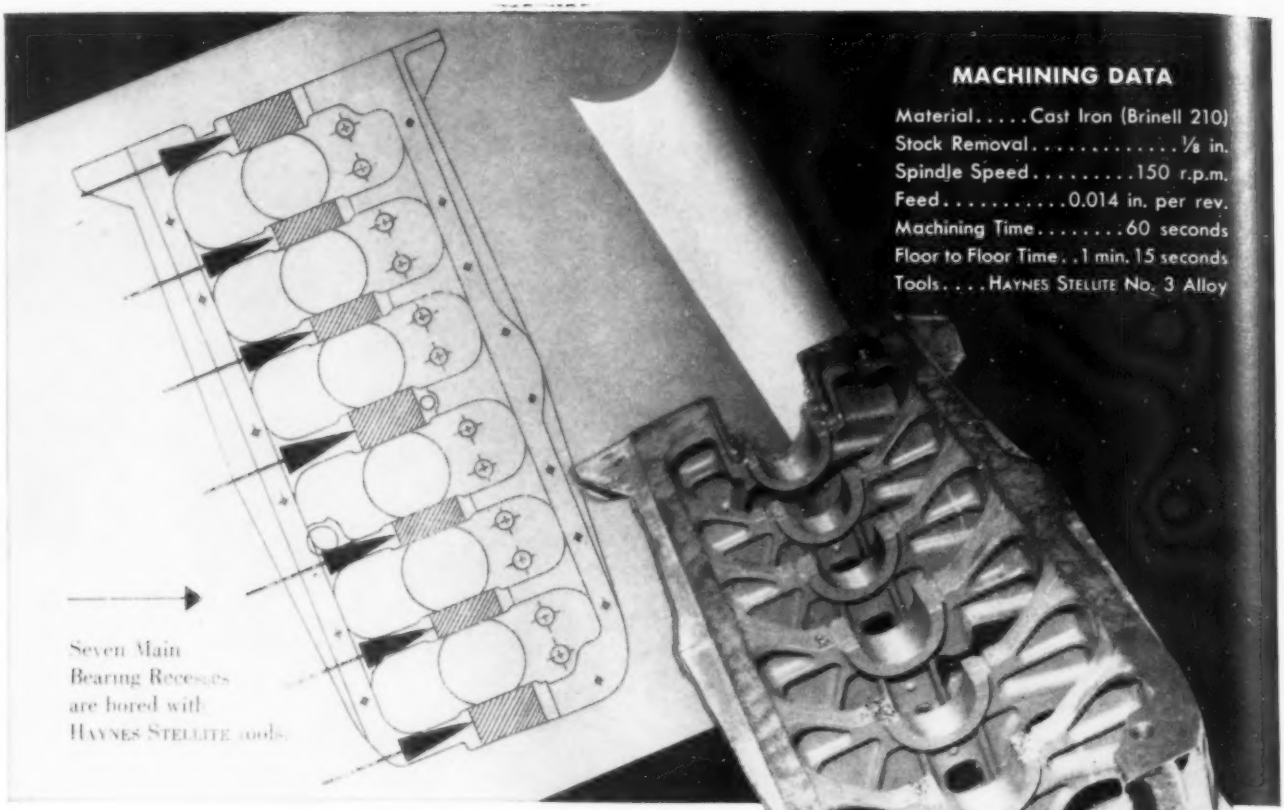
Company _____

Address _____

City _____ Zone ____ State _____

A-501-6

CO. Hartford 12, Conn., U.S.A.



48,000 interrupted cuts per grind

Haynes Stellite tools machine the main bearing recesses in 320 cast iron engine blocks between grinds. Each of 14 tools used in the set-up makes 150 interrupted cuts in each block . . . a total of 48,000 interrupted cuts per grind. The tools remain in operation for a full eight-hour shift, without chipping or spalling. Other tools tested on this job chipped under the constant hammering of the intermittent cuts, and had to be replaced in less than an hour.

Standard tool bits ⅜ in. square and 2 in. long, made of Haynes Stellite alloy No. 3, are used for this operation. Only 0.015 in. of metal has to be removed when the tools are sharpened, and the tools can be reground about 30 times. Then, when they are too short to be used for boring the main bearings, they are used to machine the smaller cam bearing recesses. In this second operation the same tools can be reground about 50 times more!

There are four grades of Haynes Stellite metal-cutting tools varying in hardness, compressive strength, and impact resistance. For a complete description of properties, sizes, and recommended operating data, write for the free booklet, "Haynes Stellite Metal-Cutting Tools."

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

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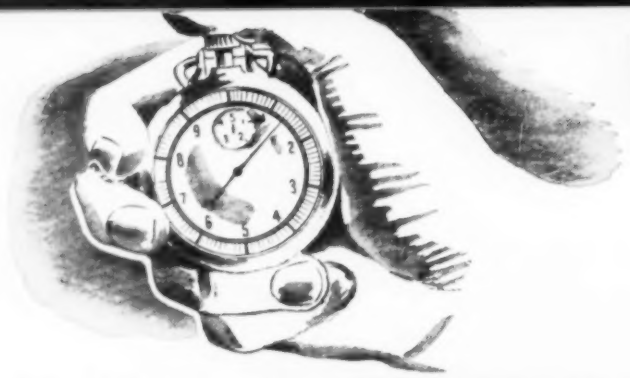
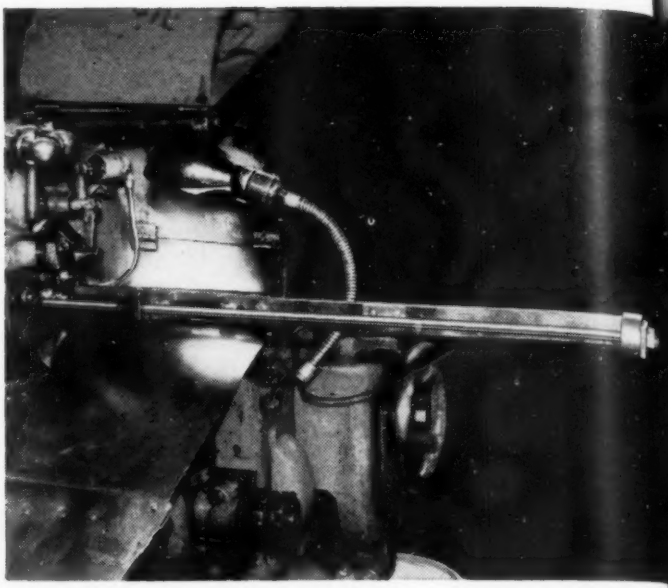
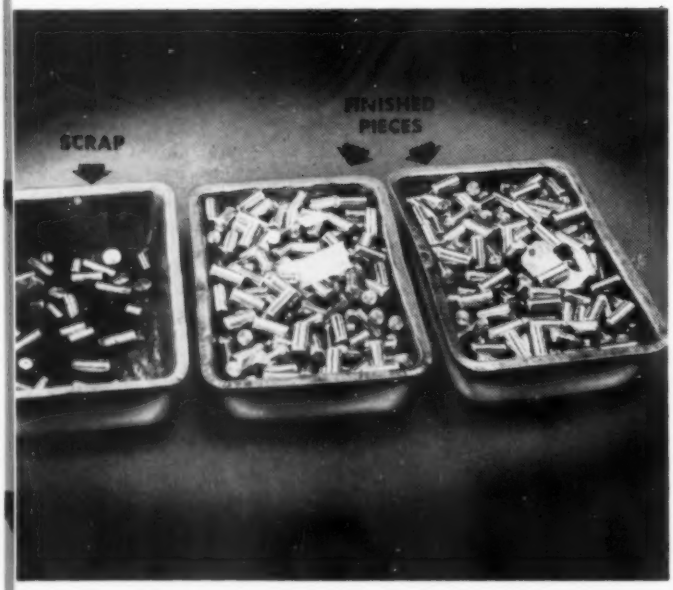


Why let the cut

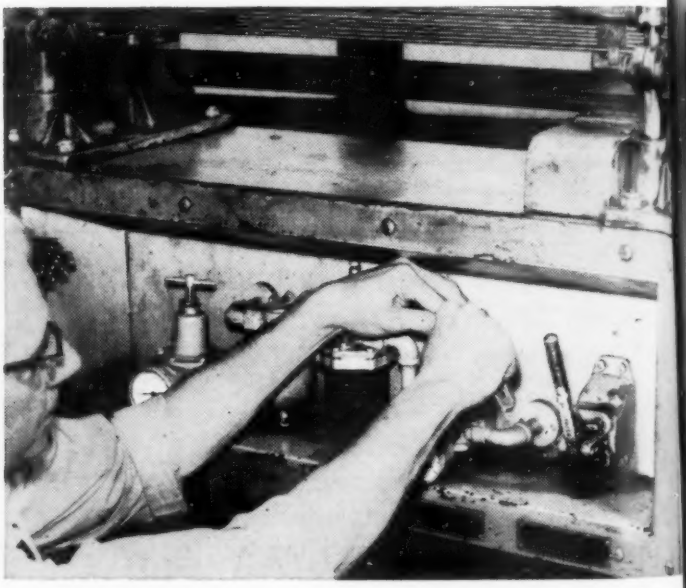
Feeds Stock Continuously . . .
there's no cutting air



No Repeat Motion . . . feeds any length in one feed-out



Reduces Scrap, Refinishing . . .
doesn't scratch or mar polished stock

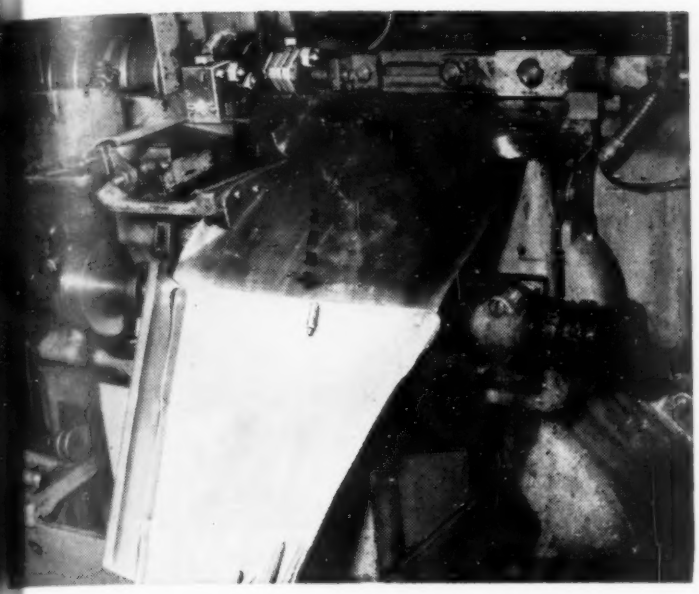


Allows Quick Set-Ups . . . no tricky adjustments for long or short runs

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION BAR FEED DIVISION

4th Dimension your production quotas?



Ejects Remnant Automatically . . . no shut-downs for remnant disposal

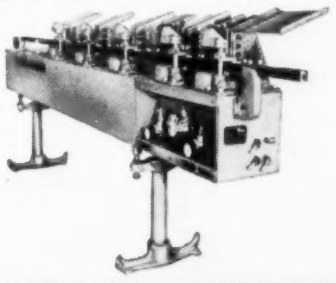
Reduces Fatigue, Slow-Downs . . . cuts nervous strain and absenteeism

Lipe A.M.L. BAR FEED boosts output 30% or more by smashing the TIME barrier

You're familiar with the three spatial dimensions on blueprints: length, width and height. But what of TIME—the important 4th Dimension that determines whether you hit or miss your production quotas?

Control Time as you control the other three dimensions—make every second perform a productive function—and you're on your way to more efficient machine use . . . new production highs . . . lower per-piece costs!

The Lipe A.M.L. (Automatic Magazine-Loading) Bar Feed converts the normal series of stop-wait-go machining cycles into one continuous, uninterrupted flow. Despite hour of day, temperature, inattention, operator skill or fatigue, it supplies stock constantly to the machine—never losing a productive second as the clock ticks on.



LIPE A.M.L. BAR FEED

The A.M.L. is an air-operated attachment which automatically feeds an 8-hour supply of bars, rods or tubing to any machine tool equipped with a stop to establish feed length. It can be put to work on practically every type of single spindle screw machine, turret lathe, centerless grinder, abrasive-wheel cut-off, punch press, cold header or die machine.

You can expect at least a 30% increase in production—that's Lipe's *guarantee*. Users report gains up to 266% due to the six features illustrated on the left. The whole story of what the A.M.L. can do for you is described in a free booklet we'll be glad to send you. Mail coupon for your copy.

LIPE-ROLLWAY CORPORATION
Bar Feed Division
Syracuse 1, N. Y.

Please send free 24-page illustrated booklet, "The Important 4th Dimension of Production and Profit."

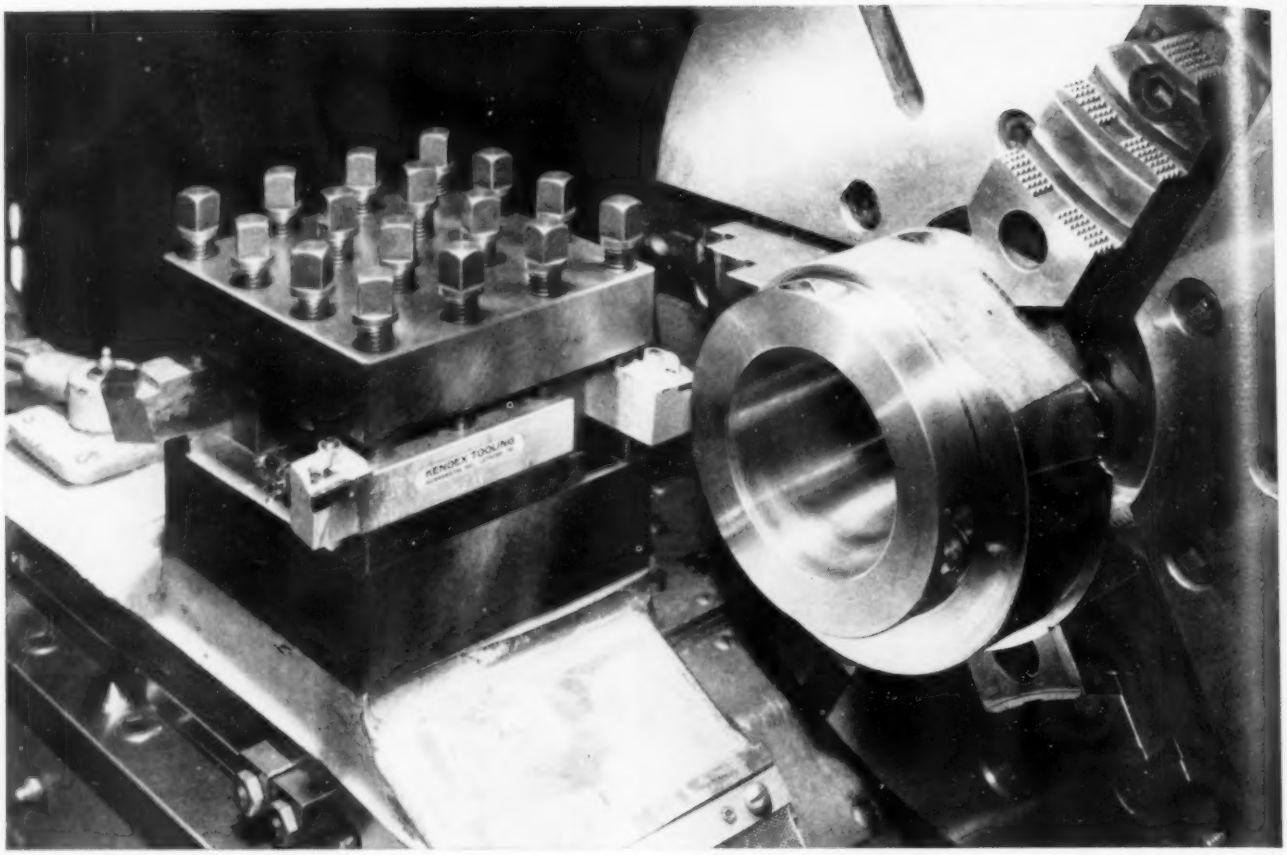
Name.....

Title.....

Firm.....

Address.....

SYRACUSE 1, N. Y.



Have you tried KENNAMETAL* Grade K21?

K21 is outperforming all other carbides in the General Purpose steel-cutting group

K21 is rapidly becoming recognized as the leader of all General Purpose steel-cutting grades in the carbide industry. Its superior performance is due to exceptionally high edge strength combined with superior wear qualities and resistance to cratering. K21 is ideal for machining the newer high tensile strength steels on modern high-speed machines, and, due to its range, it does an excellent job on older slower-speed machines as well.

K21 solves problem of troublesome operation

The photograph above shows an operation which involved turning two finished diameters on SAE 1080 steel casting with a BT16G insert in a Kendex* KTAR16 holder, using a new 40 HP Warner & Swasey turret lathe. Both cuts were made with the same tool. The 8″ diameter was rough turned at 236 SFM, $\frac{5}{16}$″ depth, and finished at 324 SFM, $\frac{1}{16}$″ depth, length of cut 2″, feed 0.0167″. The second diameter was finished at 6″, 2″ wide cut, interrupted by 3 diagonal $\frac{5}{8}$″ holes. One cutting edge turned 6 pieces before indexing, while the best competitive carbide *was unable to turn even one piece* successfully because it chipped. K21 has been standardized for this troublesome operation.

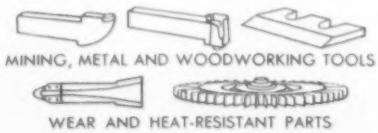
Another test showed K21 increased production 33% per index over nearest comparable, competitive grade on a finish turn at 705 SFM, 0.010″ feed, and 0.005″ depth, machining laminated stator cores.

On another job K21 eliminated breakage and lowered tool cost per piece from $0.20 for other carbides to $0.004 for K21.

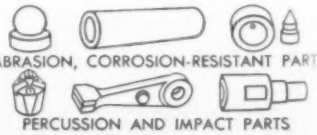
Let us demonstrate K21 and the new Kendex Tooling—a perfect team for the majority of your steel-cutting operations. Call your Kennametal representative today, or write to KENNAMETAL INC., Latrobe, Pa.

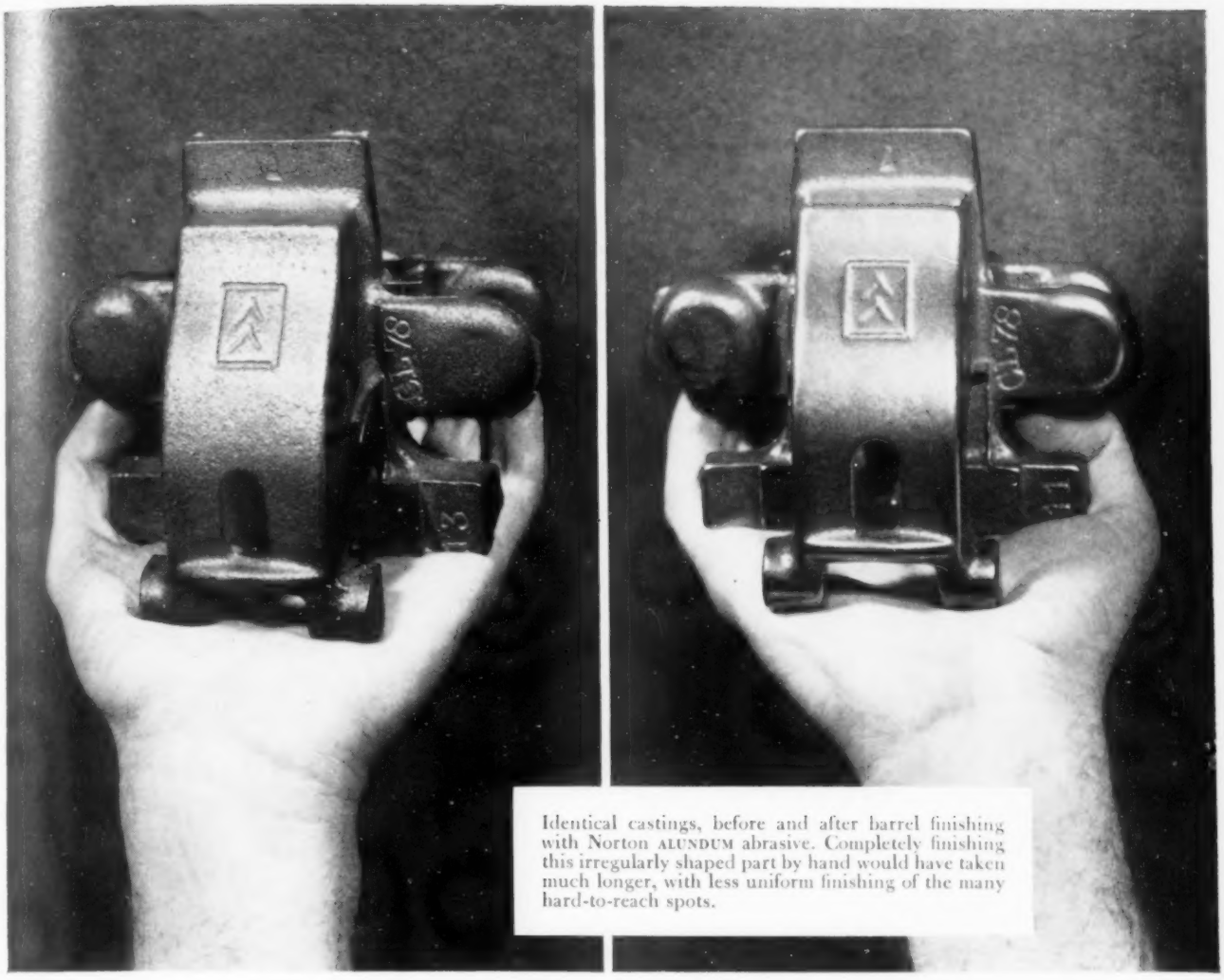
*Registered Trademark

7253



INDUSTRY AND
KENNAMETAL
...Partners in Progress





Identical castings, before and after barrel finishing with Norton ALUNDUM abrasive. Completely finishing this irregularly shaped part by hand would have taken much longer, with less uniform finishing of the many hard-to-reach spots.

ALUNDUM* tumbling abrasive tames another tough one!

Intricate parts finished faster, more thoroughly, when Norton abrasive adds the "TOUCH of GOLD"

The trickier, more intricate the parts, the easier it is to see the many advantages of barrel finishing with ALUNDUM tumbling abrasive. Hand finishing the casting illustrated, for example, would have been a long, tiresome chore — and an uneven job at best, due to the many irregularities of shape.

For parts ranging from even heftier castings down to tiny needles, there's nothing like ALUNDUM abrasive to bring out *all* the benefits of barrel finishing. This typical Norton abrasive development is sharp, dense, hard and non-fracturing. Its blocky shape eliminates slivers and chips in the tumbling process. In your tumbling barrels it assures:

- *Highest uniformity of radii and surfaces, with brightest, smoothest finish.*
- *Continual savings of man-hours, by reducing tumbling cycles, scrap and reworking to minimum.*

See Your Norton Distributor

for further facts on how ALUNDUM abrasive can add the time-saving, profit-boosting "Touch of Gold" to your finishing operations. Ask him for the new 55-page booklet on barrel finishing. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G287

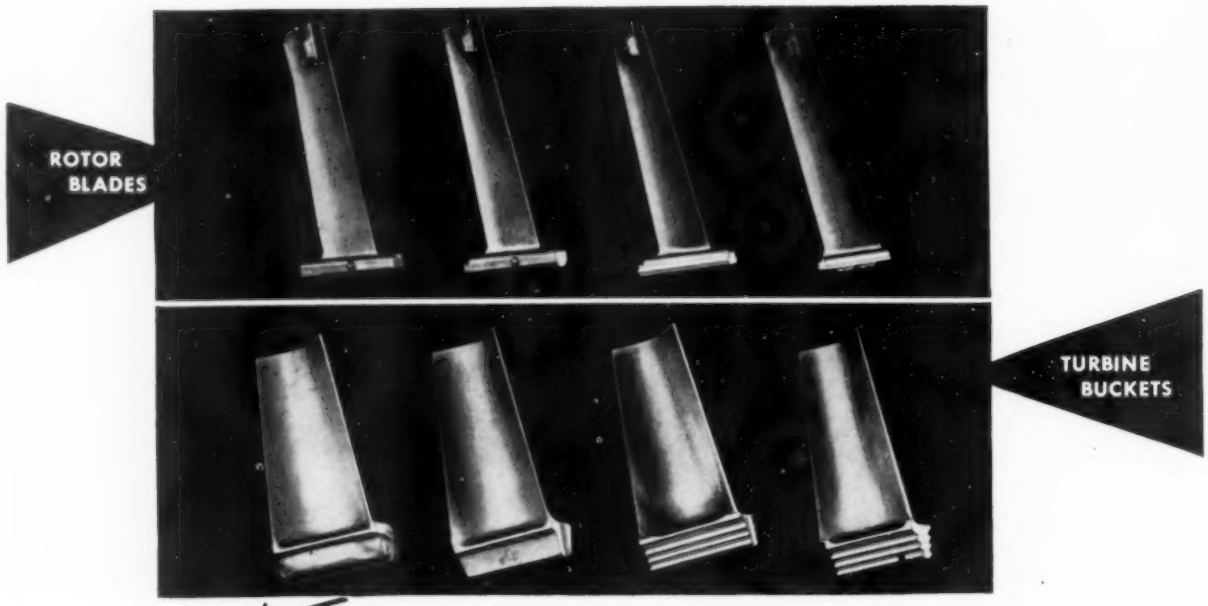
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON

Making better products... to make your products better

and its BEHR-MANNING division

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



A *Faster* MACHINING METHOD

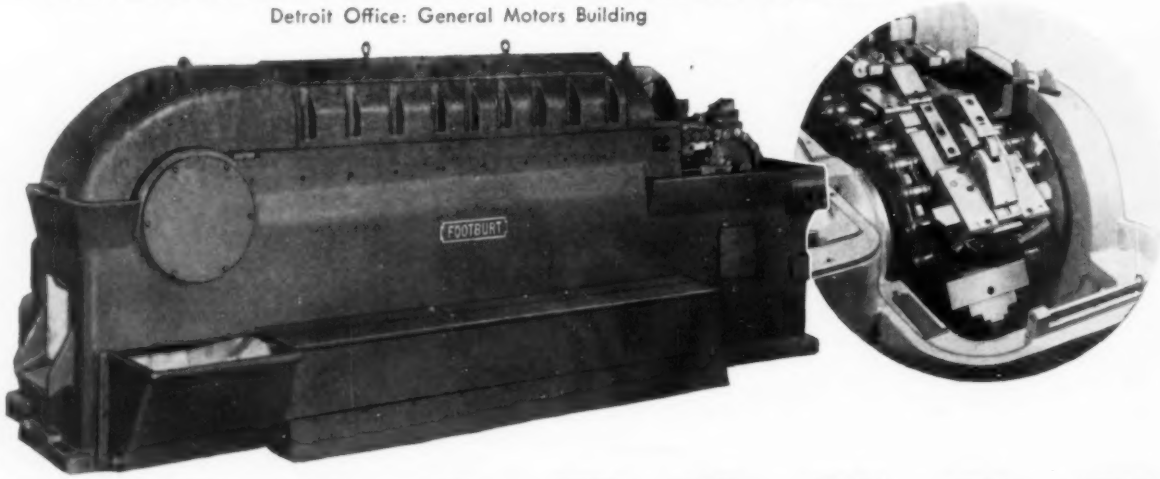
for Turbine Buckets, Rotor and Stator Blades

Footburt Surface Broaching has provided the means of reducing costs on many parts that are difficult to machine in large quantities by other methods.

Each application is individually engineered with rapidly operated fixtures for easy loading and unloading and with Broaches designed to take full advantage of the capacity of the machine. Our many years experience in pioneering the art of Surface Broaching will assure the best solution to your machining problems. Send prints and hourly production requirements for recommendations on the application of Footburt Surface Broaching.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building



☆ *engineered for production*

FOOTBURT

PIONEERS IN SURFACE BROACHING

PETERMANN

AUTOMATICS

for close tolerances...

THIS NEWEST MEMBER OF THE *Petermann* FAMILY OFFERS NEW AND VALUABLE FEATURES SUCH AS:

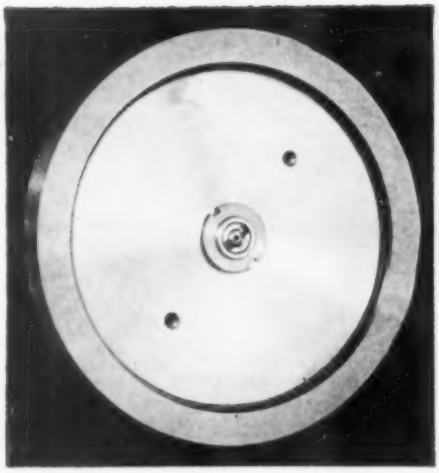
1. Six (6) radial tools (all independently controlled).
2. Hydraulic buffer for shortening the time of return stroke.
3. Accelerator which speeds up the cam shaft during "idle time"
4. Speed box change for both spindle and cam shaft.
5. Automatic lubricating system.

TYPICAL PART (shown full size) PRODUCED ON A PETERMANN AUTOMATIC

Complete tooling service and parts in America

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.



100% more pieces per grind
300% less tools required per job
400% savings in monthly tool cost

the superiority of ELOX electrical discharge grinding was proved by this large automotive company's unsolicited 2-month comparison report!**

Tool Name, Description:	Solid Carbide Insert	
Part Name:	Crankshaft	
Operation Name:	Finish Front & Rear Thrust Bearings	
	Standard Grind	Elox EDM Grind
TOTAL PIECES PER TOOL	17,290	95,904
MINUTES PER GRIND	21.0	13.75
COST PER GRIND	$ 1.26	$ .83
ESTIMATED MONTHLY TOOL COST	$294.71	$92.19

in writing Elox will guarantee increased tool productivity over any type of abrasive grinding.

Other Elox equipment available to remove broken taps, drills, etc., from $495 to $3450.

elox *corporation of michigan*

**Comprehensive report and company name given on request.
*T. M. Reg.

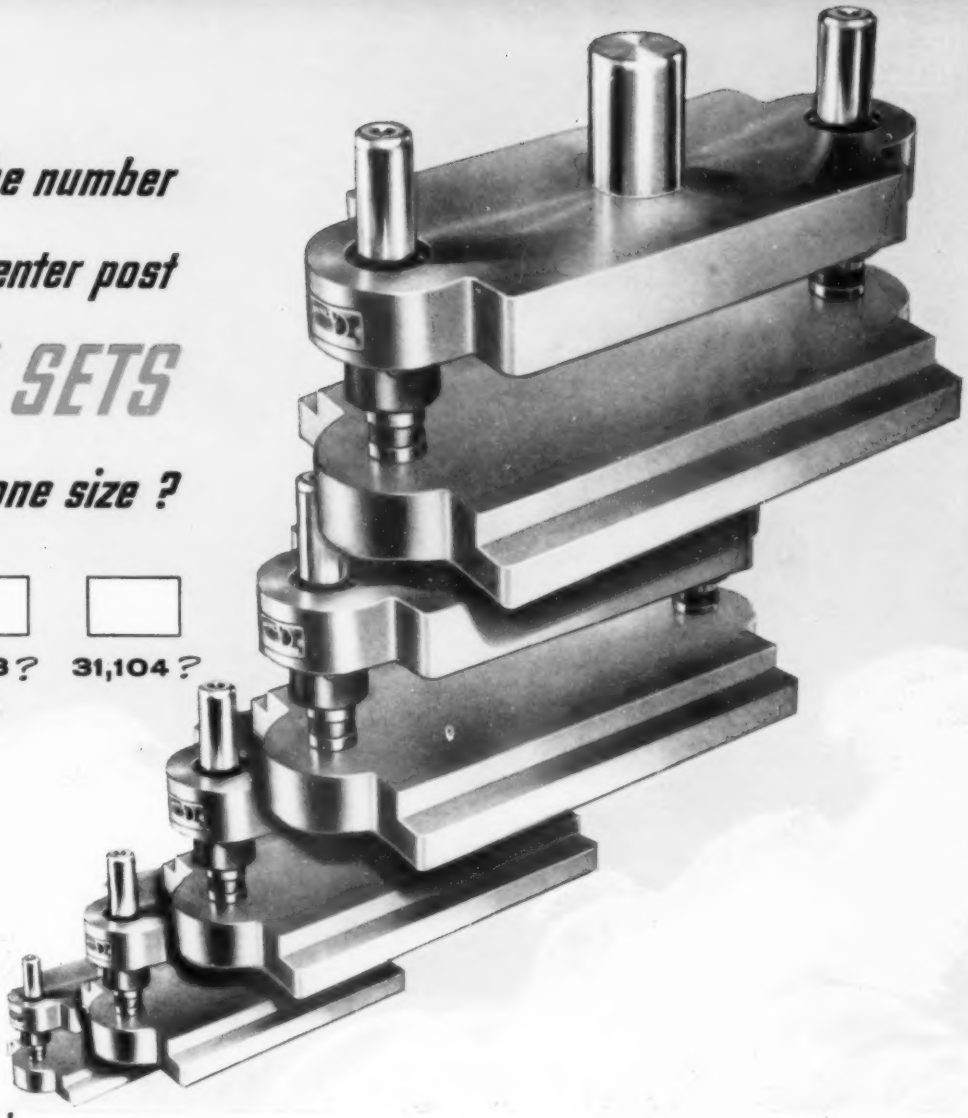
737 N. ROCHESTER RD. • CLAWSON, MICHIGAN

can you guess the number

of different center post

DANLY DIE SETS

in stock–in just one size ?



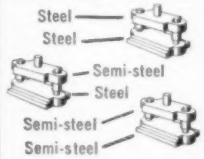
67 ? 575 ? 1433 ? 31,104 ?

3 different punch holder thicknesses

3 different die shoe thicknesses

6 shank size variations

4 bushing type variations



3 different material combinations

16 guide post lengths in each of 3 different styles to choose from

If you guessed 31,104 different standard center post Danly Die Sets in just one size . . . then you were right! Simply multiply together all of the variation possibilities shown in a Danly Catalog for a 12x12 standard center post precision Danly Die Set, and you'll get this remarkable figure. Even more remarkable is the fact that *all* of these variations are cataloged and *stocked* in every Danly Branch.

Just how does this benefit you? This almost unlimited variety of Standard Danly Die Sets in stock at your Danly Branch is your assurance that you can always get the die set you want . . . *when* you want it. That's important in saving tooling time. So remember, when you want the best in die sets—*fast*—the place to call is your local Danly Branch.

DANLY MACHINE SPECIALTIES, INC.
2501 South Laramie Avenue, Chicago 50, Illinois

Choose the Danly Branch closest to you:

BUFFALO 7
1807 Elmwood Avenue

CHICAGO 50
2100 S. Laramie Avenue

CLEVELAND 14
1550 East 33rd Street

DAYTON 7
3196 Delphos Avenue

DETROIT 16
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GRAND RAPIDS
113 Michigan Street, N.W.

INDIANAPOLIS 4
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LOS ANGELES 54
Ducommun Metals & Supply Co.,
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MILWAUKEE 2
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SYRACUSE 4
2005 West Genesee Street

DANLY®

DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

The secret of precision boring is constant close control of the tool

Precision-ground cams assure accuracy of tool paths under all conditions on a New Britain Precision Boring Machine. Equally important is split-second control of cycle timing. This is accomplished by means of the program drum illustrated at the right. Cams and trip dogs accurately time all motions of the tool and the machine units. It is enclosed by a lift-off cover and is immediately accessible from the operator's side of the machine. These are important features of the New Britain approach to more profitable precision boring.

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

The Oakite CrysCoat Cleaning-Phosphating Process for preparing metals for painting

Remington Rand's automatic Model 99 printing calculator multiplies, divides, adds and subtracts... prints and proves each step on easy-to-read Simpla-tape. And beneath this "mathemagical" machine's fine finish is a protective coating of CrysCoat to make it look better... last longer.

There's an Oakite CrysCoat Process to suit your particular set-up: –

1. Zinc phosphating in spray washer
2. Zinc phosphating in tank
3. Iron phosphating in spray washer
4. Iron phosphating in tank

Each CrysCoat Process gives you a fine phosphate foundation for long-lasting paint adhesion.

Each CrysCoat Process protects against corrosion under the paint.

Each CrysCoat Process is easy to control.

Each CrysCoat Process is solidly backed by nationwide Oakite Service that unconditionally guarantees satisfaction.

Illustrated literature describing the Oakite CrysCoat Cleaning-Phosphating Process gladly mailed on letterhead request.
Oakite Products, Inc., 28A Rector Street, New York 6, N.Y.

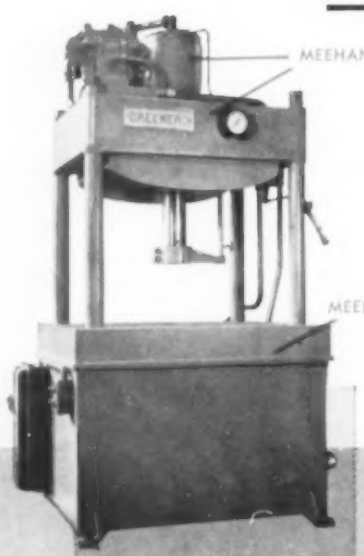
SPECIALIZED INDUSTRIAL CLEANING
OAKITE®
MATERIALS · METHODS · SERVICE
SCIENCE

CrysCoated Products Look Better... Last Longer!

Technical Service Representatives Located in Principal Cities of United States and Canada

The MEEHANITE® Casting Reporter

ALL GREENERD PRESS CYLINDERS ARE MEEHANITE METAL



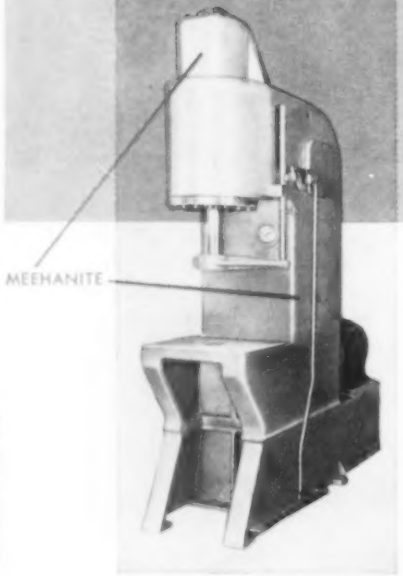
The Greenerd Arbor Press Company, Nashua, New Hampshire, specifies Meehanite metal for many of their important component parts and *all* of their Press cylinders.

These cylinders are cast of Meehanite Type GA (50,000 psi) as well as the top and bottom caps of Presses under 30 tons capacity. The 30-ton Hydraulic Press is of box-type construction and cast of tough, dense Meehanite metal which reduces the vibration to a minimum. The Meehanite cylinder is a separate unit, bored and honed to size.

The 75-ton, four-posted type Hydraulic Press is a rugged machine designed for all-around maintenance and production work. The head and table are also Meehanite castings providing high tensile strength which insures rigidity and uniformity; and, of course, the cylinder is also cast of Meehanite metal.

THE MANUFACTURER SAYS:

"All our cylinders today are Meehanite castings as well as the top and bottom caps of Presses under 30 tons capacity. We also used Meehanite castings for the main frame of our 30-ton Press and on the 75-ton Press, the head and work table are cast of Meehanite metal. Meehanite castings are used for all these parts because we are particularly interested in securing strong, extremely close grain and pressure tight castings."



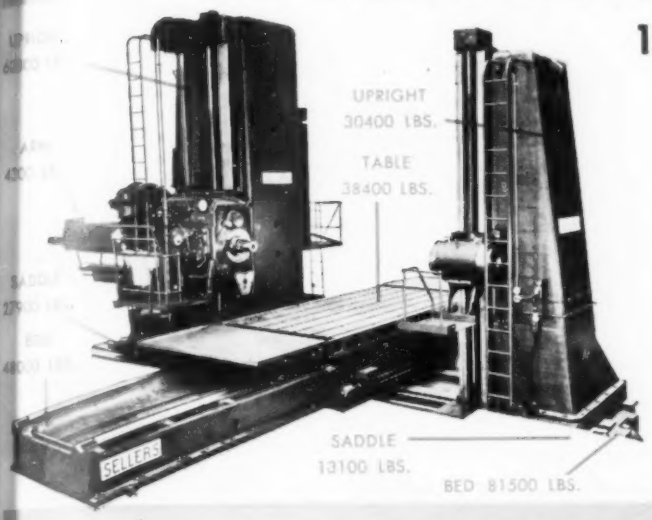
MEEHANITE METAL SPECIFIED FOR PRECISION-MACHINED SURFACE PLATES

The Goodman Manufacturing Company of Chicago, Illinois, has for years been making surface plates, one of the absolute necessities for answering the present-day requirement for greater precision in machine tool work.

THE MANUFACTURER SAYS:

"Our customers frequently specify the use of Meehanite castings for surface plates because Meehanite metal definitely provides the very fine grain structure and reduced deflection on the surface of a given surface plate for a given load, because of the superior physical characteristics of the material."

Industries report what Meehanite Castings have done for them



154 TONS OF MEEHANITE CASTINGS IN FARREL-BIRMINGHAM'S BIG SELLERS HORIZONTAL

A new Sellers, 8-inch, planer-type, horizontal boring, drilling and milling machine, built by Consolidated Machine Tool Company, Rochester, New York, has been installed in the Ansonia, Connecticut, plant of Farrel-Birmingham Company, Inc.

Meehanite castings from 27 different patterns were produced for this huge horizontal, ranging from a few pounds to 40½ tons. The more than 154 tons of Meehanite metal probably make over 90 per cent of the entire weight of this machine.

THE MANUFACTURER SAYS:

"We have long recognized the value of Meehanite metal's soundness and guaranteed physical properties to meet specific requirements. In this Sellers horizontal, for example, the heavy proportioning of the uprights and the superior vibration-damping qualities of Meehanite metal combine to practically eliminate deflection. The 96-inch x 204-inch table is likewise factored to resist sag under loads up to a maximum of 70 tons, thus permitting machining operations within extremely close tolerances.

In this case, as in thousands of other heavy machines and machine tools built with Meehanite castings under exacting controls from materials procurement to finished product, a highly satisfactory answer to our needs is being provided by Meehanite metal."

ONLY A MEEHANITE FOUNDRY CAN MAKE MEEHANITE CASTINGS

The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington and Dover, New Jersey
Blackmer Pump Company	Grand Rapids, Michigan
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio & Grove City, Pa.
Crawford & Doherty Foundry Co.	Portland, Oregon
DeLaval Steam Turbine Co.	Trenton, New Jersey
M. H. Detrick Co.	Newark, N. J. and Peoria, Ill.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Georgia Iron Works Co.	Augusta, Ga.
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
Hardinge Manufacturing Co.	York, Pennsylvania
Johnstone Foundries, Inc.	Grove City, Pennsylvania
Koehring Co.	Milwaukee, Wisconsin
Lincoln Foundry Corp.	Los Angeles, California
Palmyra Foundry Co., Inc.	Palmyra, New Jersey
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
Shenango-Penn Mold Co.	Dover, Ohio
Sonith Industries, Inc.	Indianapolis, Ind.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Vulcan Foundry Company	Oakland, California
Washington Iron Works	Seattle, Washington

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Hartley Foundry Division— London Concrete Machinery Co., Ltd.	Brantford, Ontario
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Otis Elevator Co., Ltd.	Hamilton, Ontario

Write for your copy of **"The Handbook of Meehanite Metals"**

This Advertisement Sponsored by Foundries listed above

MEEHANITE METAL® CORP.

714 North Ave., New Rochelle, N. Y.

LINDBERG INDUCTION UNIT REDUCES BRAZING COSTS BY 50%

It happened in Hawthorne, California, at the Sonnet Tool and Mfg. Co., manufacturers of HELICARB Helical Carbide Cutting Tools. After installing a Lindberg 25 KW induction unit, average brazing time required for a production run of tools was tremendously reduced, resulting in substantial production economies. At the same time, product uniformity was far superior to that achieved by the previous method.

In addition to the obvious dollars and cents savings in time, labor and brazing materials, the Lindberg unit is cleaner and allows more comfortable operating conditions, according to Sonnet.

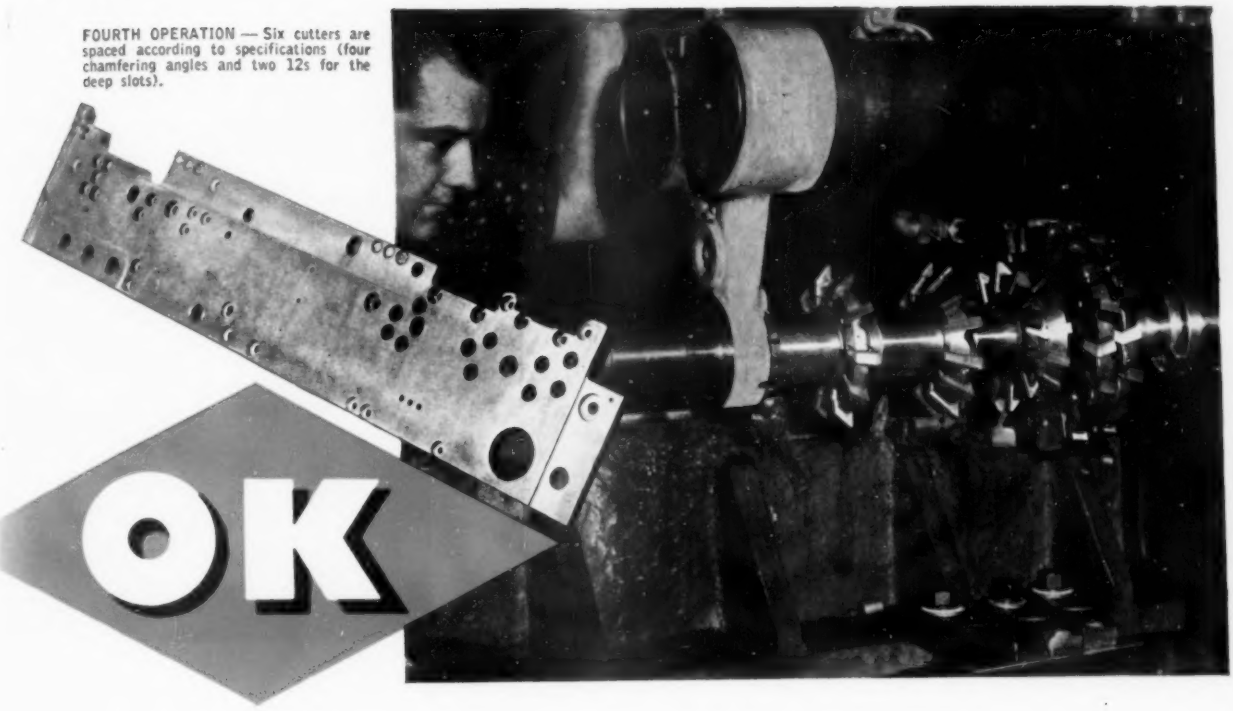
Lindberg engineers will gladly provide you with information on equipment relating to your application. See your nearest Lindberg field representative, or write for bulletin 1441.

Left to right: MERLE HILLIARD, *Vice President and General Manager;* E. C. "BUD" SUNDERMAN, *Shop Superintendent;* PAUL SAXMAN, *Chief Engineer*

Shop Superintendent, E. C. "Bud" Sunderman says: "One of the wisest investments we ever made was in our Lindberg induction unit. It has opened up new fields of carbide tooling, and has improved manufacturing procedures."

LINDBERG HIGH FREQUENCY DIVISION

Lindberg Engineering Company • 2447 West Hubbard St, Chicago 12, Illinois



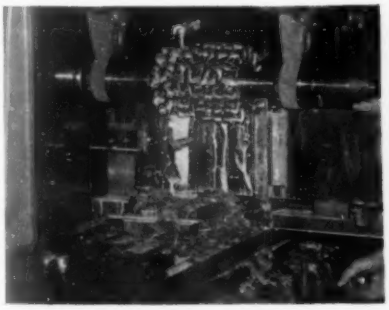
FOURTH OPERATION — Six cutters are spaced according to specifications (four chamfering angles and two 12s for the deep slots).

H.S.S. milling cutters remove 44 CU. IN. chrome-moly in 40 MIN.

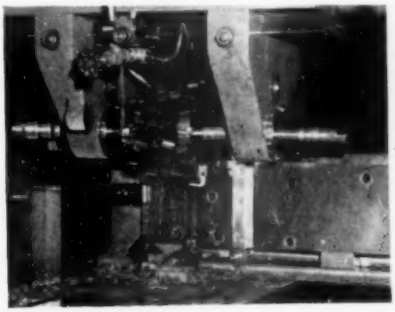
At FARMINGDALE, LONG ISLAND, *Liberty Products Corporation,* achieve outstanding results on a complicated profile milling job using OK Tool high speed steel inserted blade milling cutters. A gang set-up of standard interlocking alternate angle, half-side and special chamfer mills take out 44 cubic inches of metal in the fast time – for finish milling – of better than one cubic inch per minute.

¶ Three plates, 33 x 8 x 1⅜, chrome-molybdenum steel, are solidly bolted together using pilot pins to spot locations. The job is completed in four operations as shown in the photographs. Number three Kearney & Trecker milling machines are used and the *total time for all operations* is 120 minutes, an average of 40 minutes per plate. Tolerances are held to plus or minus .005 inches.

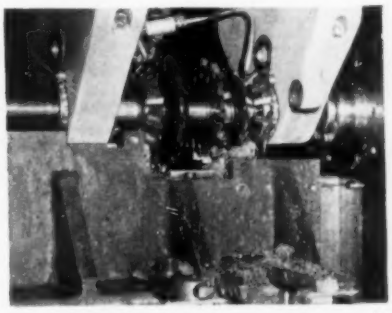
¶ This is another instance where high efficiency and economy are gained by correct job analysis and good judgment in the use of *modern milling cutters on modern milling machines.*



FIRST OPERATION — Seven alternate angle cutters (four 8s and three 7s) make a two-step cut through three chrome-moly plates bolted together.



SECOND OPERATION — Six alternate angle cutters (one 10, three 8s and two 6s) are gang mounted to make this three-step cut.



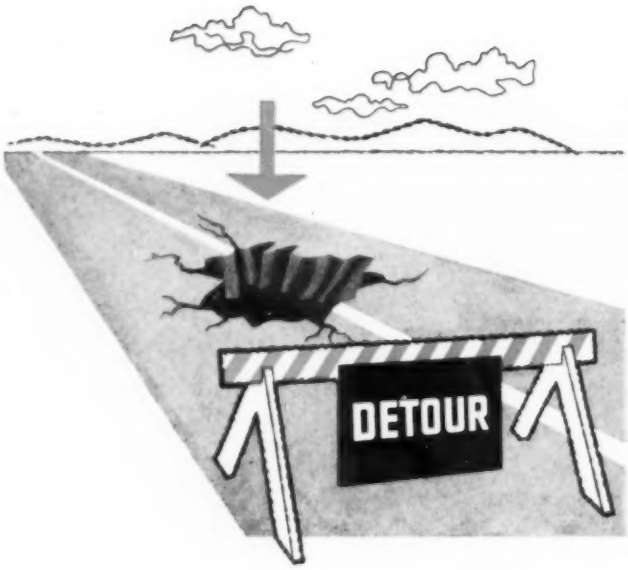
THIRD OPERATION — Five chamfer milling cutters (three 7s and two 10s) miter more slots made on previous operations.

Write for OK Tool Catalogs

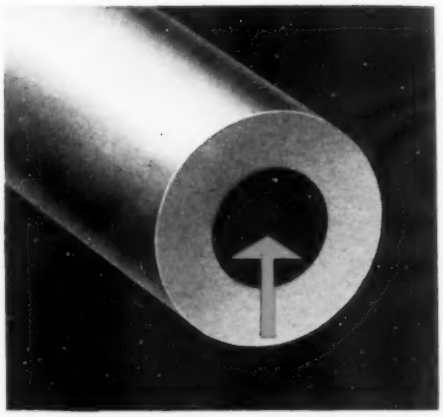
"MODERN MILLING CUTTERS FOR MODERN MILLING MACHINES"
"AMERICA'S FIRST SYSTEM OF SINGLE POINT TOOLS"

modern milling cutters for modern milling machines

THE OK TOOL COMPANY, INC., Milford, New Hampshire



a hole here wastes time . . .



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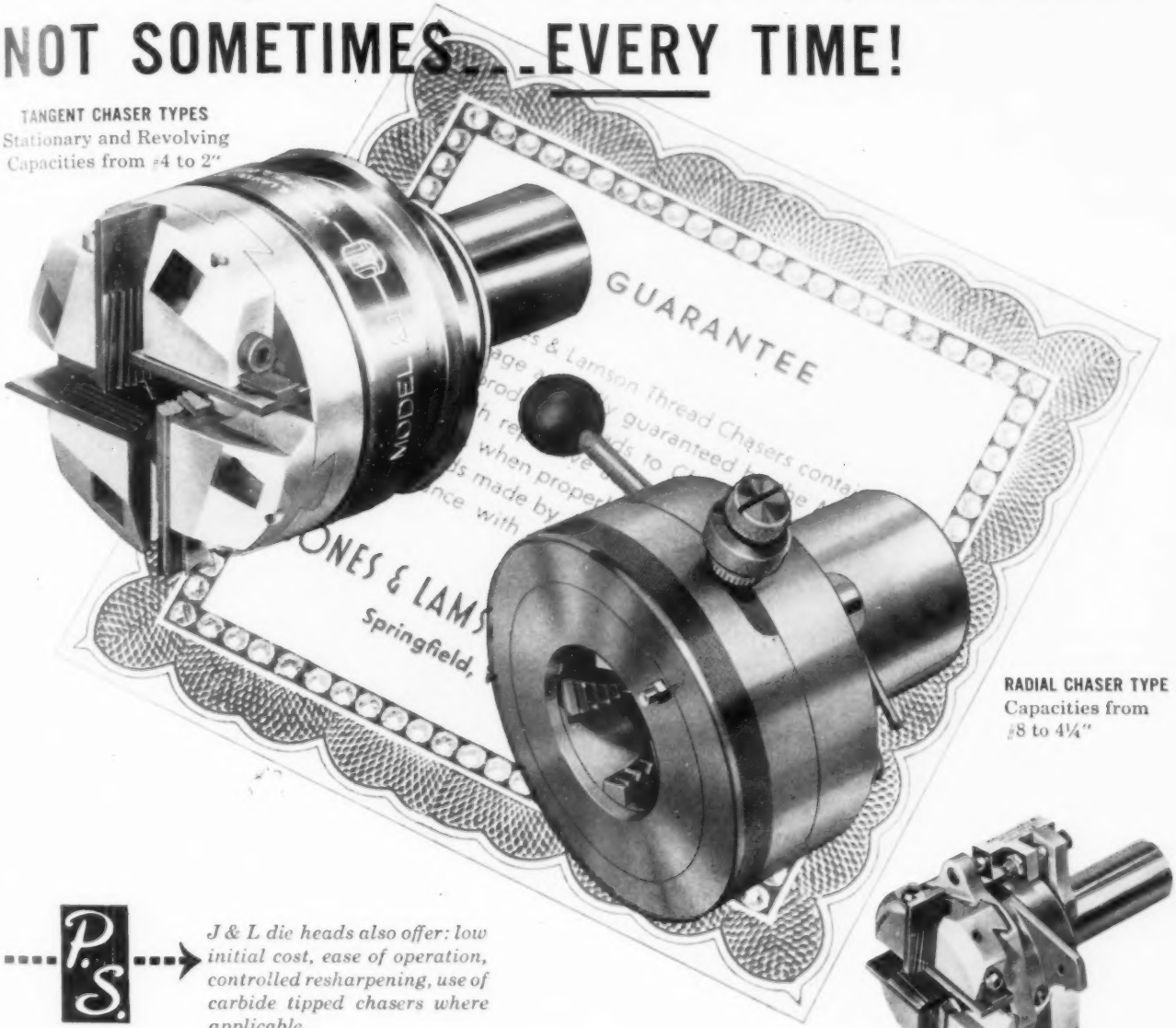

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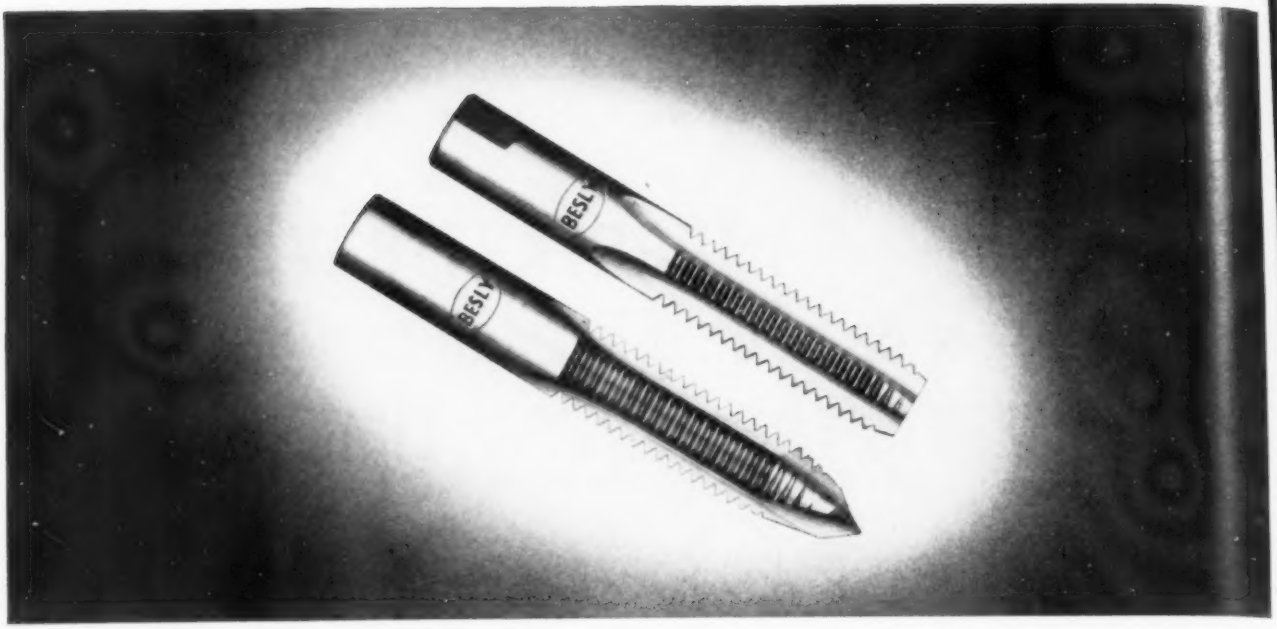

New Besly Stub Tap for Screw Machines

SAVES SET-UP TIME • FITS STANDARD BUSHINGS • HAS STRONGER SHANK

Available at No Extra Cost from BESLY

A new, shorter length tap that need not be altered before use in screw machines has just been made available as a standard item by Besly-Welles Corporation. Developed in cooperation with the National Screw Machine Products Association, the new tap conforms to standards recently drawn up by that group.

SHORTER SHANK, SHORTER THREADED PORTION

The shank (and threaded portions in larger sizes) of the new Stub Tap have been shortened to enable it to fit into the space between the spindle nose and tool holder of screw machines. In the past, it has been necessary for users to cut off part of the shank and even part of the threaded portion of standard hand taps to fit them into screw machines . . . or order higher priced "specials." Now, screw machine operators can save set-up time by using the new Stub Tap just as it comes in the package.

SIMPLIFIES BUSHING INVENTORY

The shank of a Stub Tap is the same size as its nominal O.D. This permits standard sized bushings to be used and reduces bushing inventory problems. The full diameter shank provides greater strength than standard hand taps which have shanks usually turned down in the larger sizes.

FACTORY-PERFECT ACCURACY

The shank of the Stub Tap is made concentric with the threaded portion, assuring accurate alignment in the tool holder. Since it is not necessary to cut off the forward threaded portion of a Stub Tap, chamfer and back taper are maintained factory-perfect. Squares, except for two small driver flats at the end of the Stub Tap, are eliminated. This permits better holding power, better alignment and longer accuracy.

FAST DELIVERY FROM STOCK

Complete stocks of the new Stub Tap will be on hand at Besly distributors by June 1. Users will be able to get the same fast delivery on Stub Taps as they have on other Besly standard taps.

AVAILABLE IN SIZES THROUGH 1-IN.

The new Stub Tap is made in fractional sizes from ¼-in. through 1-in. and in machine screw sizes from #0 through #14. A bulletin describing the new Stub Tap and giving the standards applicable to it is available at no cost or obligation. See your Besly distributor or write or call:

BESLY **BESLY-WELLES CORPORATION**
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Telephone: FRanklin 2-1222
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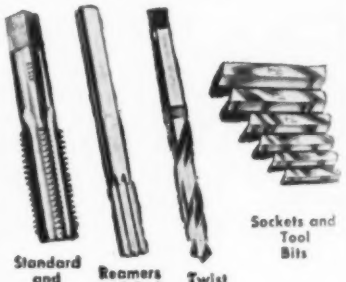
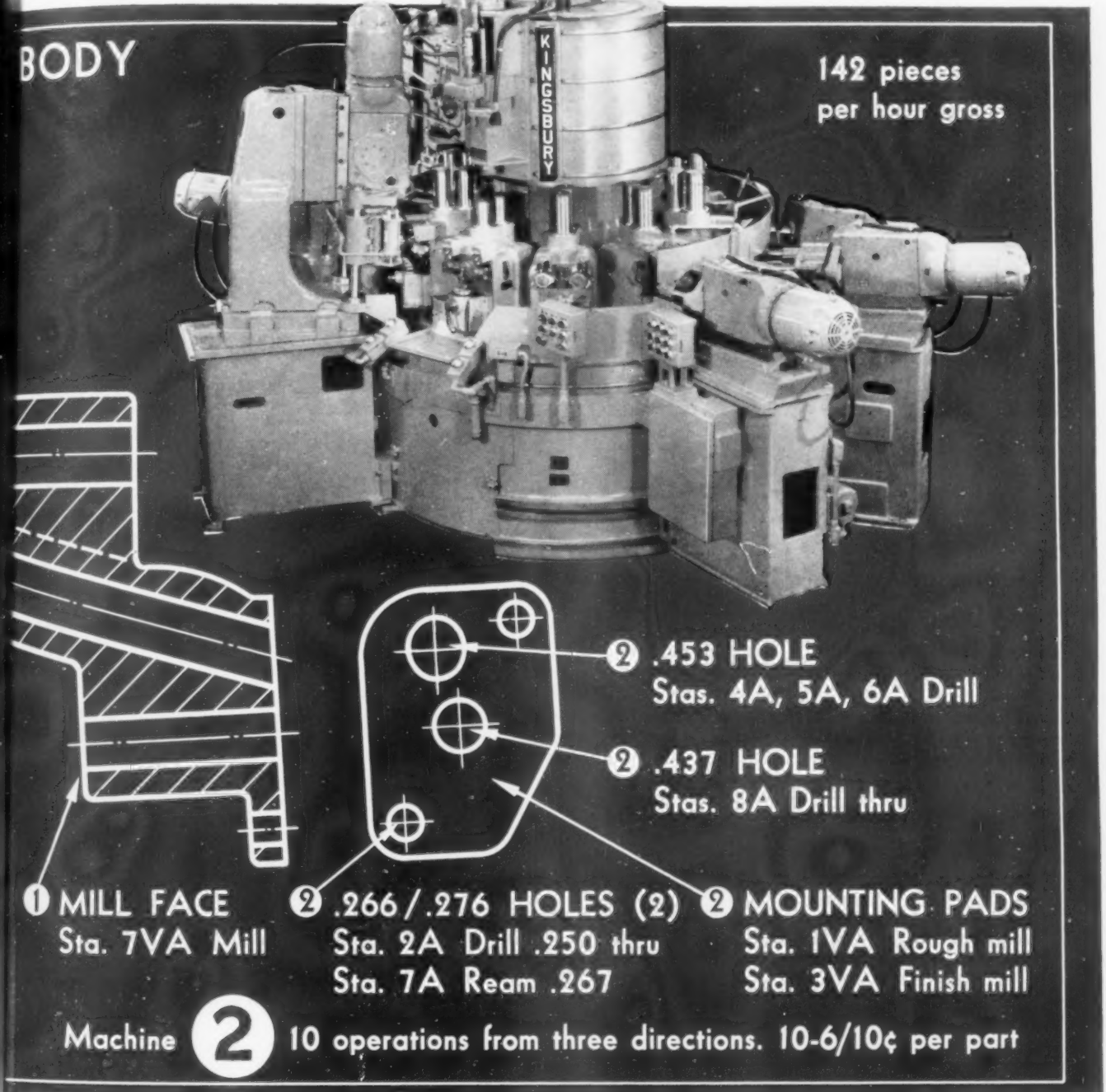
BESLY HAS THE COMPLETE LINE



Order *all* of your cutting tool needs for your screw machines from your Besly distributor—your quality source for a complete line that means long life, accurate cutting and lower tool costs.

The blueprint tells only part of this Kingsbury story. The rest is told in Keene, New Hampshire, in one of the most modern machine tool plants in New England. Here Kingsbury engineers study your part specifications — for your Kingsbury must do the operations *you* require at the rate you name.

Each Kingsbury machine is custom-built, but it is never built "from scratch." Even the work-holding fixtures, specially designed for each part, are developed from a background of years of experience and knowledge of what is required for accuracy and safety — *and what works*. Every mechanism has been tested in field service. Standard Kingsbury bases, drilling, and tapping units,



indexing mechanisms, lubricating and cutting-oil systems, electrical and mechanical controls . . . all are coordinated in an automatic machine which must perform correctly "first time round" — and year after year in your plant. Perhaps our *mental attitude* has a lot to do with the success of Kingsbury machines. We are specialists. Since 1918 we have built more than 5,000 Kingsburys and we know what a Kingsbury can do. When we tell you a Kingsbury *can* do your job to *your* satisfaction, we're ready to prove it!

KINGSBURY MACHINE TOOL CORP.
108 Laurel Street, Keene, N. H.

"We increased our tool life 40% and improved the finish 43 microns"

Mr. D. E. Gillmor, Vice President of Gillmors, Inc., Gulf Assistant District Manager Don Gallaher, and Mr. George Glaeser, General Foreman of Gillmors, examine several of the ti-stainless parts machined with Gulf Electro Cutting Oil.

"WE tried scores of cutting oils over a period of months in an effort to increase tool life and get a better finish in machining type 321 titanium stainless steel. Then a Gulf Sales Engineer recommended Gulf Electro Cutting Oil.

"Right away results were phenomenal. Tool life was increased over 40% and surface finish was improved 43 microns."

Gulf Electro Cutting Oil has proved to be the answer to many tough machining problems like this. It contains both free sulphur—held in stable solution—and sulphurized mineral oil, in which the sulphur is chemically combined by an exclusive Gulf process. This combination provides high sulphur activity over the entire range of a cutting operation—gives the tool maximum protection and helps to reduce built-up edge. It also has excellent anti-weld characteristics and extreme load carrying ability.

And remember that Gulf provides a complete line of quality cutting oils that will help you get improved production and longer tool life in all your machining operations. Write, wire, or phone your nearest Gulf office and have a Gulf Sales Engineer recommend the most suitable type for every job.

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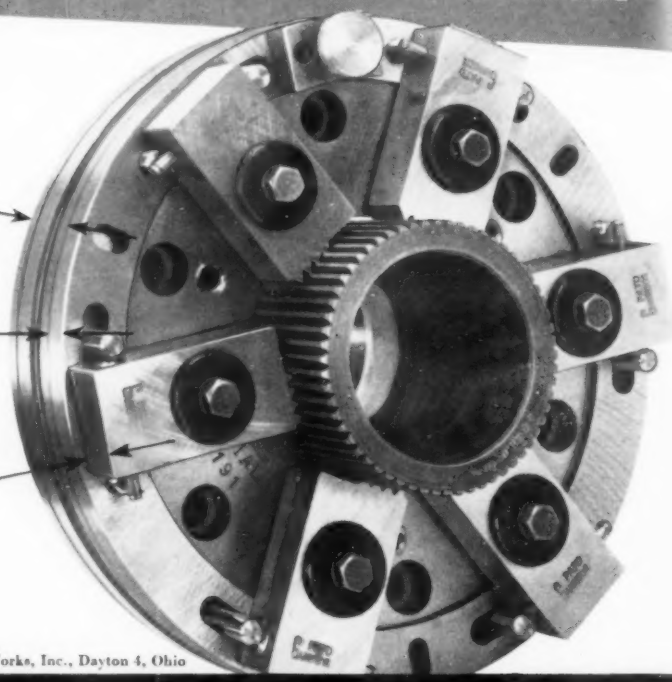

Photo courtesy of Garrison Machine Works, Inc., Dayton 4, Ohio

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Blanchard Surface Grinders are ideal for all kinds of precision grinding jobs. They produce extremely close tolerances for flatness, size and parallelism . . . *at low costs and high production rates.* Many Blanchard users grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001", with dimension tolerance of .0002", and surface finish to better than 3 micro inches.

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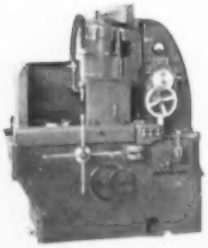

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THE BLANCHARD MACHINE COMPANY

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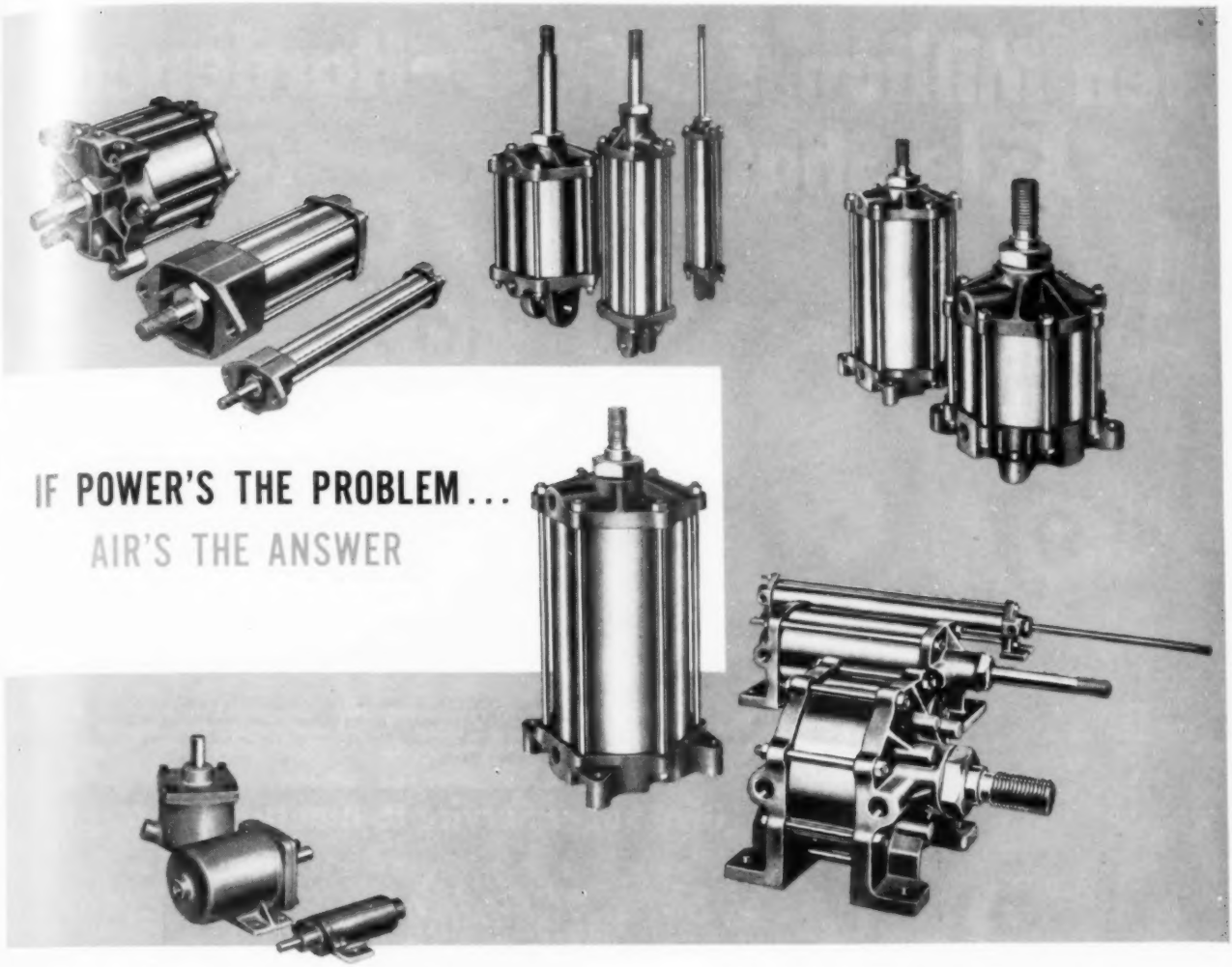

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The Tool Engineer

Why Take A Step Backward?

Our American colleges and universities have always seen the need for revisions of their engineering curricula to keep pace with our constantly changing and improving technology, and the accompanying demands put on their graduates. Thus, many schools have been teaching manufacturing processes and methods, including actual machine shop training. A graduate with such training is better able to move into industry. Because he has operated many of the present day machine tools with his own hands, he has a better knowledge of production problems and is therefore more valuable to his company the day he is hired.

Industry will be startled to learn that some of our best schools are eliminating the "practical" subjects and are substituting new engineering science curricula. Others plan to follow suit unless they can be made to see the error of their decisions.

This trend indicates more emphasis on scientific courses, higher mathematics (advanced differential equations, no less, for all undergraduates), advanced physics, nuclear energy, nucleonics, etc. and a de-emphasis and even complete elimination of shop courses and drafting. The "product" could be a "theorist" completely devoid of any practical knowledge or experience. Unfortunately, with the shortage of engineers, such graduates can be crammed down the throats of American industry whether it likes it or not.

Industry knows what kind of engineer it needs from colleges—a graduate with a sound theoretical background and a good foundation in putting it to practice. Industry is not getting what it needs and many times must set up its own training program combining theory and practice. What more proof do our colleges and universities want?

It is our duty as tool engineers to recognize what is happening and convince industry to let its needs be known to educators before it is too late. This must be done now! The industrial leadership of America may be at stake.

H. B. Osborn Jr.

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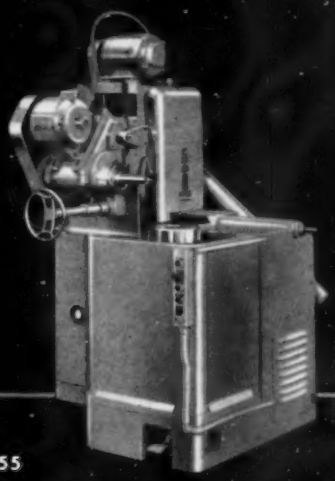

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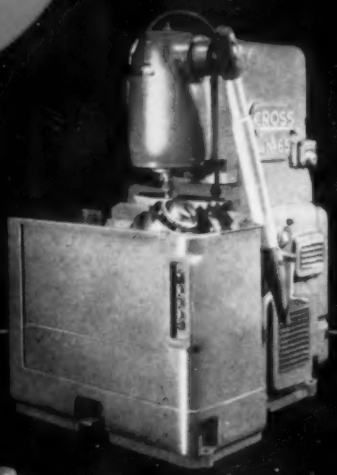

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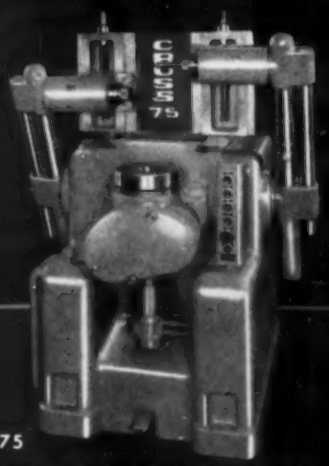

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- ★ Push button controlled automatic cycle.
- ★ Hydraulic power work clamping.

For mass production or short run jobbing operations, there is a Cross Gear Machine to suit your requirements.

Established 1898

THE CROSS CO.

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Special MACHINE TOOLS

Fig. 1. Ceramic tool bit in conventional clamped toolholder proves practicability of cutting steel with ceramics.

Ceramic Tools Machine Steel Fast

By W. B. Kennedy
Chief, Experimental Machining Branch
and
Bennett Bovarnick
Chief, Sintered Metals and Ceramics Branch
Rodman Laboratory
Watertown Arsenal
Watertown, Mass.

Accomplishments of the preliminary phase of a broad program for evaluating ceramic materials as metal-cutting tools are reviewed in this report. Design of a new type toolholder is disclosed, and methods of grinding ceramics and geometry of ceramic tools are discussed. This preliminary investigation indicates that machining speeds three times as fast as currently used are feasible with ceramic tools.

OF MAJOR IMPORTANCE during periods of strategic emergency is the critical supply of the commonly used materials for metal-cutting tools. Difficulties in procuring tungsten carbide and high-tungsten high-speed steel tools during World War II and again during the Korean war have proved the advantages that would be obtained if a satisfactory nonstrategic ceramic cutting tool were available. Hard ceramic materials are present in abundant supply and could be substituted for strategic tungsten, cobalt, molybdenum, chromium and vanadium contained in high-speed and tungsten carbide cutting tools. Several ceramics are available at considerably less expense than carbides or high-speed tool steel and they are responding to cutting tests successfully, *Fig.* 1.

Some ceramics possess certain properties that are superior to those in the conventional materials used as cutting tools, although other properties of these

W. B. Kennedy

Bennett Bovarnick

A strong investigating team has been formed by combining the 20 years of practical machining experience of W. B. Kennedy with the theoretical and practical experience in ceramics of Bennett Bovarnick. Mr. Bovarnick formulates, tests and evaluates materials, while Mr. Kennedy designs, tests and evaluates tool bits. Working closely together, these two have been able to progress steadily, basing each forward step on the results of the previous tests. Mr. Bovarnick formulates ceramics to meet requirements of cutting tools and Mr. Kennedy designs tool bits to recognize limitations of the materials.

ceramics are less desirable. Hardness, high-temperature strength and wear resistance properties of ceramics are generally superior to metallic tool compositions. Tensile strength at room temperature, ductility and thermal shock resistance of ceramics, however, are usually inferior to those for carbides and high-speed steels.

A successful alternate material should be hard, have high strength and be plentiful. A desirable requirement, which could be waived in emergencies, would be low cost. A simple technical-data survey showed that the number of potential materials that satisfied all of these requirements was small. In order of hardness, they were: boron carbide, silicon carbide, aluminum oxide and titanium carbide.

It was understood that difficulties, which had not been resolved, would be present in the preparation, fabrication and evaluation of these materials. At about this time, it was learned that aluminum oxide could be cemented to dense solids with the use of an auxiliary bonding phase, similar to the method that is used to form tungsten carbide with cobalt. Because of previous experience in the processing of tungsten carbide base compositions, it was felt this technique could be used with the new materials. For aluminum oxide, the favorable auxiliary phase is a glass composition, preferably neutral.

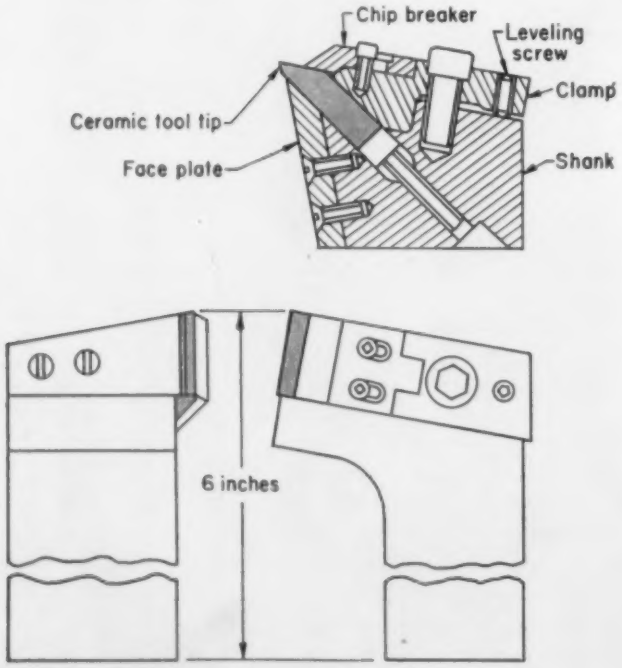
The earliest reported investigations of aluminum oxide were conducted in Germany and Britain at the turn of the century. Prior to World War I, patents were granted in these countries that described the preparation of sintered aluminum oxide and its use as a tool material. In the period between the wars, work was expanded and resulted in the development of material with additions of chromium oxide similar to the ruby composition and structure.

During World War II, German efforts led to an aluminum oxide base material with additions of chromium oxide. Although this material had promising characteristics for tool application, it was never put into quantity production for this purpose. In the postwar period, a ceramic tool bit with an alumina base has been commercially distributed in England. This tool is suggested for machining nonmetallic materials such as plastics and rubber. Recent activity in Russia has been reported, but claims for their developments have not been verified.

Aluminum oxide occurs naturally as emery, corundum, sapphire and ruby. In each of these forms, the compound is in its hardest and most dense crystalline phase. The major industrial source of alumina is the ore bauxite. The mechanical properties of the naturally occurring forms of aluminum oxide can be obtained by material that is processed from refined bauxite. These properties are generally reported as follows:

Compressive strength, psi	400-450,000
Transverse rupture strength, psi	40-50,000
Tensile strength, psi	30-40,000

Fig. 2. To compensate for the limitations of ceramics, this special toolholder was designed so that the only loads applied to the material are compressive.



Hardness:	Knoop	2,000-2,200
	Rockwell A	90-92
	Moh	9-9+
Melting point, F		3,720

These values indicate the potential applicability of aluminum oxide base compositions for metal-cutting operations.

Processing of aluminum oxide powder to dense solid materials may be accomplished by several techniques. These include hot forming or pressing, after which no further operation is required, and cold pressing, slip casting and extrusion or hydrostatic pressing. Each of the latter methods is followed by a sintering or firing operation. With these techniques aluminum oxide base compositions have been solidified from the powder to densities of 98 percent of the theoretical density of the mix. At such density levels, mechanical properties approach those previously listed.

Tool Design

A logical solution to problems of machining with ceramics would be to use the results of prior work so that tool design would take advantage of desirable features and minimize inherent weaknesses. It was recognized that the following factors would require consideration in ceramic tool design. The toolholder shank must have substantial cross-section to give maximum support for the cutting tool. Clamping forces must be evenly distributed to minimize stress concentration. An adjustable, mechanical chip breaker must be used to protect against fatigue. Overhang must be minimized to reduce deflection and bending stresses. Tool geometry should be calculated to resist linear feed forces and tangential cutting forces.

To provide the necessary characteristics, an entirely new toolholder was designed, *Fig.* 2. This toolholder has many unusual features and may find wider application than was contemplated during its design. The cutting tip is oriented in the toolholder so that its smallest cross-section is perpendicular to and its long dimension is collinear with the resultant of the metal-cutting forces—radial, tangential and feed forces. Such orientation causes the cutting material to be loaded in compression without superposition of tensile or bending loads, thus taking advantage of the high compressive strength of ceramics.

The ceramic tip is held in the correct position by a broad faced adjustable clamp. A leveling screw is incorporated on the clamp to insure flat contact on the wide ceramic surface. Because some of the softer ceramics tested in conventional holders were seriously abraded, the toolholder designed for use with ceramics has a hardened faceplate to protect the ceramic side clearance face from the abrasive action of curling chips. The continuously adjustable chip breaker can be regulated without removing the toolholder from the lathe or releasing the holding force of the clamp. Solution of the holding problem for this material was a significant factor in the accomplishment of successful machining results.

Determination of the optimum tool geometry for most efficient metal-cutting was equally important.

Fig. 3. Single-point ceramic tool geometry for obtaining optimum machining with current tool bit materials.

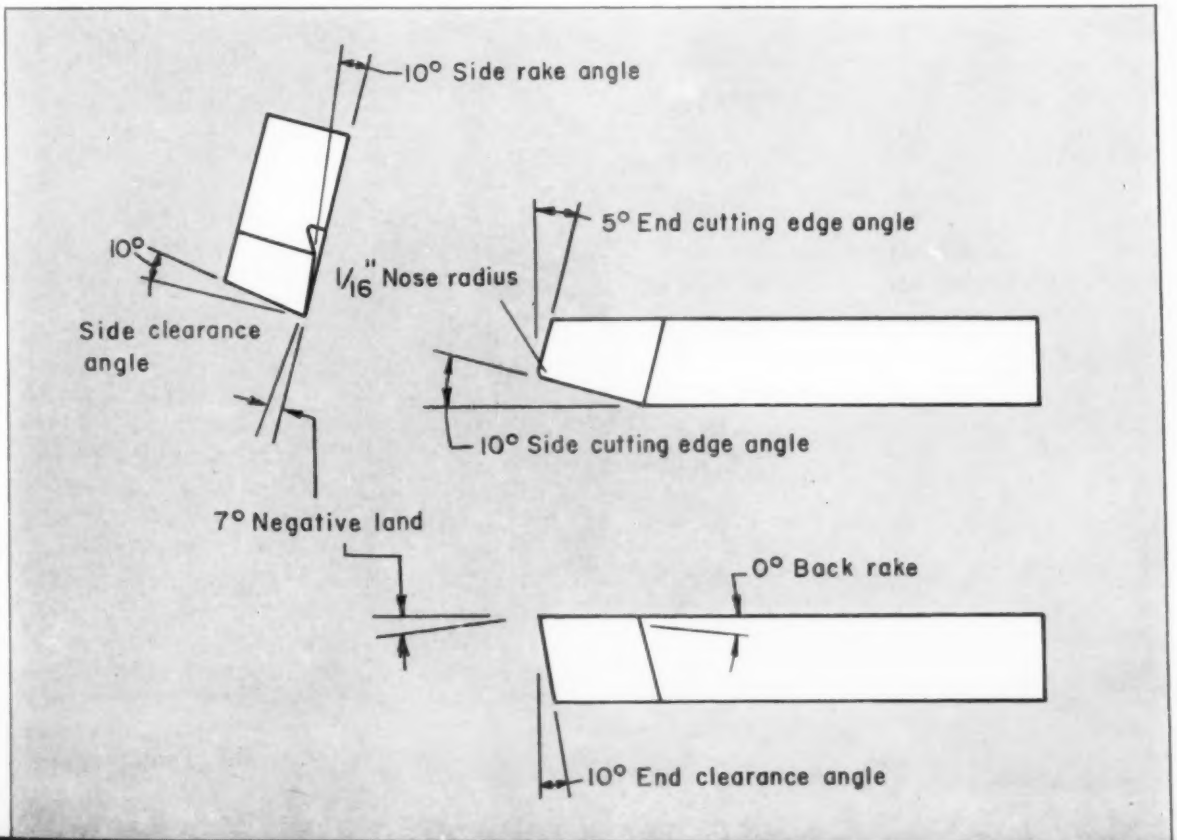


Table 1—Analyses and Hardnesses of Workpieces

Workpiece Material	Composition[1] (%) Cu	Zn	Pb	Sn	Fe	Brinell Hardness[2]
Brass—Commercial Grade	62.0 Max	30.0 Min.	3.0 Max	0.3 Max	0.75 Max	101

	Alloying Elements (%) C	Mn	Si	Ni	Cr	Mo	Brinell Hardness
Cast Iron	2.7	1.68	2.13	2.06	—	—	174
SAE 1020	0.20	0.45	0.18	—	—	—	120
SAE 4140	0.40	0.87	0.30	—	0.95	0.20	183
SAE 4140	0.40	0.87	0.30	—	0.95	0.20	300[4]

[1] Analyses from commercial data
[2] 3000-kg load
[3] 2000-kg load
[4] Heat treated

Table 2—Machining Tests with Ceramic Tools

Workpiece Material	Speed (sfpm)	Linear Feed (inch)	Depth of Cut (inch)	Tool Travel (inches)
Brass	650	0.010	0.125	88
Cast Iron	300	0.010	0.125	70
SAE-4140	350	0.010	0.125	76
SAE-4140	250	0.008	0.125	184
SAE-4140	600	0.008	0.160	102
SAE-4140	950	0.008	0.125	106
SAE-4140[1]	910	0.012	0.250	86
SAE-4140	1200	0.012	0.125	120

[1] Heat treated to 300 Brinell

After intensive study, it was determined that the best tool performance was obtained with the geometry shown in *Fig.* 3. Side and end clearance angles are larger than those usually used with carbide cutting tools. However, the negative 7-deg land provides additional support to meet the initial cutting force and also protects the cutting edge from the curling chip. Test results showed little variation in tool life with various back rake angles, although they may be useful in interrupted cutting applications.

These angles were ground on the tip using standard diamond-impregnated wheels of 150 grit for rough forming and 350 grit for finishing. The negative land was ground to a width slightly wider than the anticipated feed, roughly 0.015 to 0.020 inch. Ceramic bits were ground dry since available grinders were not equipped to supply a copious flow. An inadequate flow of coolant can cause intermittent heating and cooling with possible cracking of the ceramic because of its low thermal shock resistance. Since ceramics have excellent heat resistance, no difficulty was encountered in grinding tools without coolant. A feather edge that remained after grinding was carefully removed with a diamond-impregnated hand hone of 350 grit.

Experimental work on the dimension for the nose radius showed that it was desirable to employ a

Fig. 4. Ceramic cutting tools yield clean unscored chips that can be curled or broken as desired.

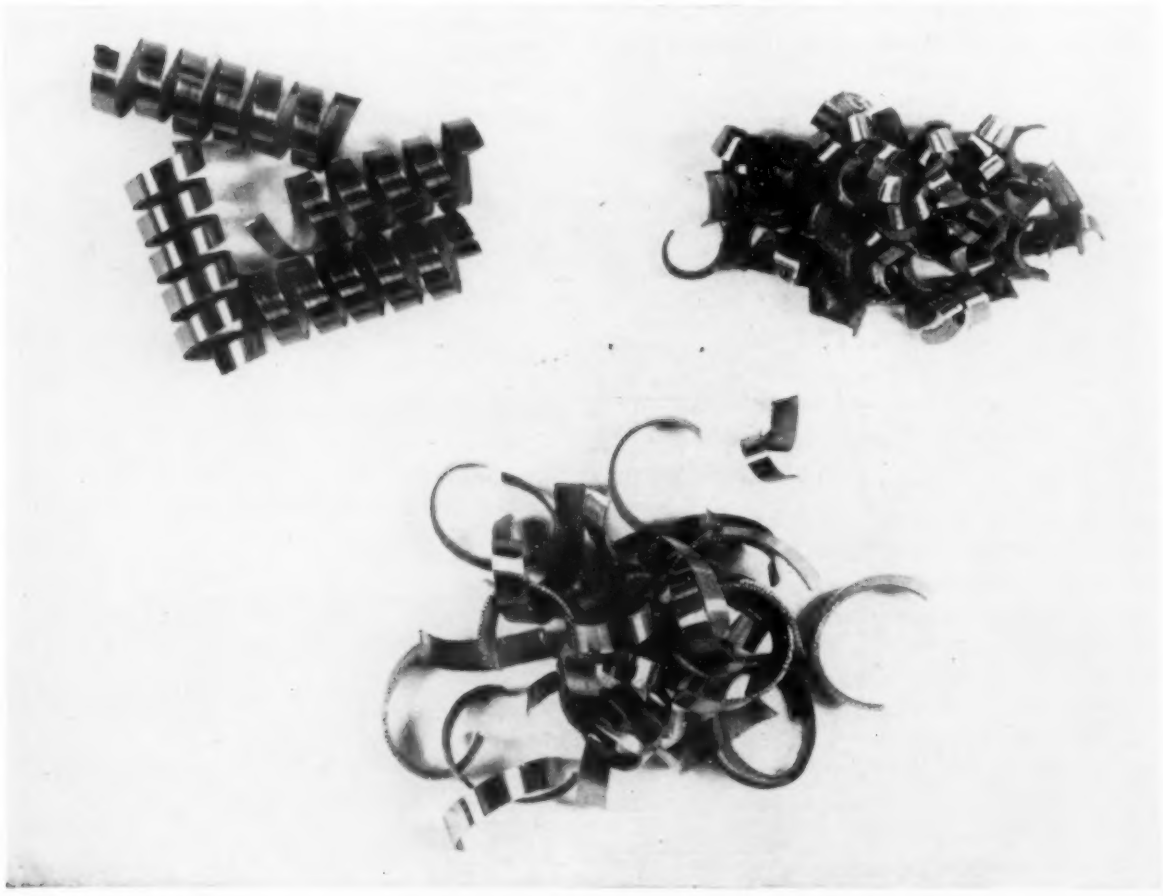


Table 3—Comparative Machining Tests

Factor	Cutting Tool Material		
	High-Density Aluminum Oxide	Carbide Grade C-6	Carbide Grade C-7
Speed (sfpm)	1000	500	500
Linear Feed (inch)	0.0075	0.0075	0.0075
Depth of Cut (inch)	0.125	0.125	0.125
Tool Travel (inches)	82	80	90
Chip Platform Cratering (inch)	None	3/32	Slight
Edge (Land) Wear (inch)	1/64	3/64	2/64

fairly large radius to assure optimum performance. Although it is usual practice to have a nose radius of about $\frac{1}{32}$ inch on tungsten carbide cutting tools, best performance with ceramic cutters was attained with a nose radius of $\frac{1}{16}$ to $\frac{1}{8}$ inch. It is believed that the ceramic material needs the additional support obtained with the larger radius.

Limited efforts to braze ceramics to steel holders with metal solders did not lead to a satisfactory joint. Bonding of ceramics to steel with commercial organic bonding materials was also investigated. It is possible to form a mechanical bond with this material that might be suitable for cutting tools used in light machining operations, but failure resulted at normal cutting tool temperatures since the flow point, about 350 F, of organic materials was exceeded.

Machining Tests

The machine used for the experimental work is a standard 18-inch engine lathe powered with a 10-hp motor through a speed range from 17 to 700 rpm. Workpieces were supported between a 4-jaw chuck and a ball-bearing tailstock center. No coolant has been used in any of the machining tests. Workpiece materials were commercial brass, a low alloy cast iron, and SAE 1020 and 4140 steels. Workpiece hardnesses and compositions are listed in TABLE 1. Since brass and cast iron presented no serious machining difficulties, the majority of evaluation tests are being performed on 4140 steel.

Results shown in TABLE 2 are typical of the performance that was obtained with the best ceramic composition processed to date. The column labeled "Travel" is not the tool life, but represents the point at which the cutting edges required regrinding. Tips were reground when unsatisfactory work surface and chip formation indicated the need. Because of the limited supply of ceramic tool tips, no effort has been made to determine maximum tool life.

Appearance of the steel chips, *Fig.* 4, leaves little to be desired from the viewpoint of clean cutting and freedom from scoring. These characteristics have been attributed to the absence of top face cratering of the ceramic material. The low affinity of aluminum oxide for metals explains the minimum top face cratering caused by chip friction.

This phenomenon, together with the high rotating speeds used, produces chips of a thickness closely approximating the predetermined linear feed per revolution. Excellent workpiece surface finishes have been produced, particularly in the high-speed range. Workpiece and cutting tool remain cool providing the chip breaker is adjusted to prevent cramping of the chip.

As the exploratory studies proceeded, results indicated the potential advantages of ceramics as tool materials. In order to verify these observations, a test was conducted to compare the performance of the ceramic with commercial carbides. The carbides selected for the test were grades C-6 and C-7. ("Equivalent Carbide Grades," THE TOOL ENGINEER, January 1955, p. 117.)

End points of these comparative tests again were when the condition of the work surface and chip indicated the need for redressing. Test conditions and results are shown in TABLE 3. For these machining conditions, it was concluded that ceramics can perform at cutting speeds at least 100 percent greater than those used with carbides.

These tests have been restricted because of the limited quantity of ceramic bits available. The supply is still limited because the tips are produced only in experimental quantities. As the supply increases, the scope of the tests will be broadened to include many more phases of metal-cutting operations.

Acknowledgments

The authors would like to acknowledge the support and encouragement given to this work by Col. Alden P. Taber, Commanding Officer; Lt. Col. H. V. Mackey, Director of Research & Development; J. F. Wallace, former Director and P. A. G. Carbonaro, present Director of the Rodman Laboratory. Appreciation is also expressed for the efforts of F. S. DeLacey in conducting the literature survey and assisting in experimental activity.

gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Quick Acting Clamp

Recently the tool design room had to devise a quick-setting clamp for a rather unusual part. The resulting tool has proved quite practical in use and has a number of features worthy of consideration for similar jobs. As shown in the accompanying sketch, the part is located on two undersize pins and clamped against the two hub ends.

To use the clamp, the part is loaded on the pins. The threaded stud is then pushed forward until the clamp contacts the part. This stud is then turned clockwise to rotate the swivel clamp to the position shown. After the swivel clamp has been positioned, the threaded stud is turned just enough to securely clamp the part in place. Support buttons hold the clamp in a horizontal position at all times and a support block provides ample bearing for the threaded stud.

Unloading is accomplished by turning the stud counterclockwise, which rotates the swivel clamp into the opening in the main block. The entire clamp assembly may then be pulled out until the front collar hits the support block. Then the part may be easily removed from the locating pins. The spring and locknut arrangement is used to provide the necessary tension on the swivel clamp so it will turn with the threaded stud during loading and unloading operations. Spring tension may be varied to suit operating conditions by adjusting the locknuts on the threaded stud.

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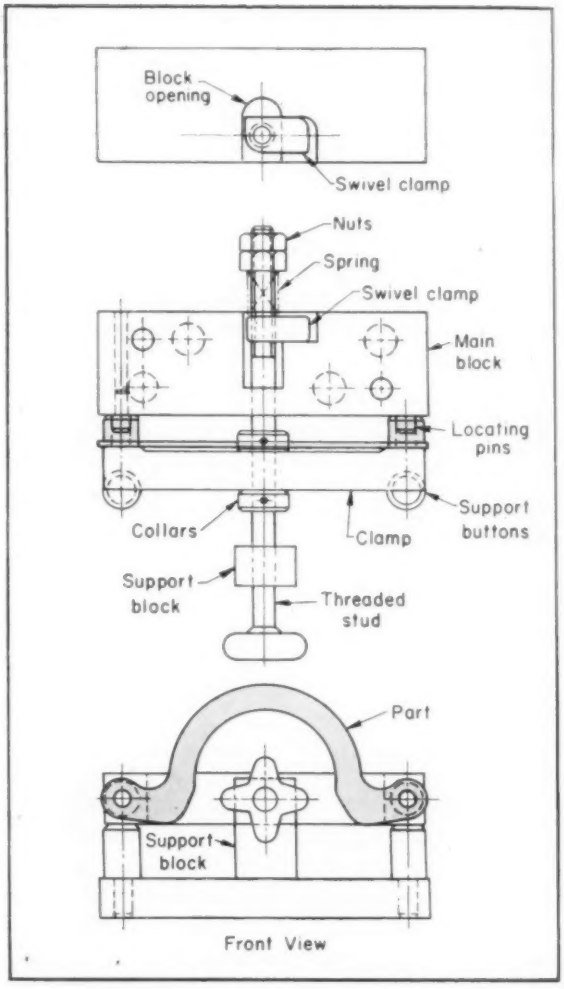


Precision Centering Device

On many cylindrical grinding jobs it is important for center holes to be of exact uniform depth on all pieces of the run. One reason for this is to avoid resetting table stops on the grinder when the pieces are to be peripheral and shoulder ground. Once the setup is made, if a center hole is drilled too deep, stock will position too far to the left; if too shallow, stock will position too far to the right.

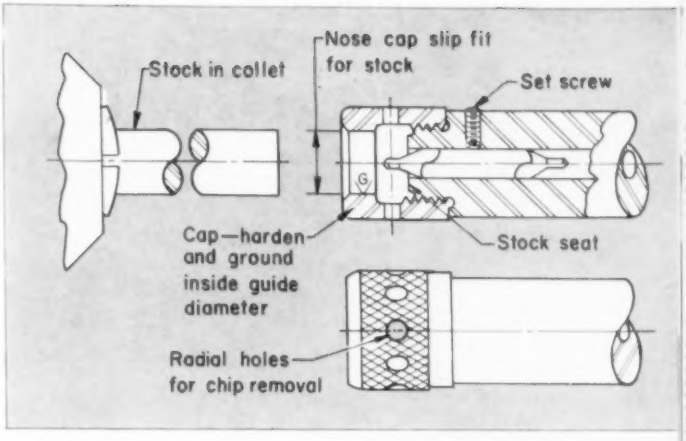
In conventional center drilling on a turret lathe there is possibility of variations of depth due to axial slippage of stock in the collet while stop gaging length from the hexagon turret. This condition and carelessness of the operator can cause considerable trouble when work reaches final grinding operations. The center drilling device illustrated gages center hole depth independently of the position of the stock in the collet of the lathe. It also aids in centering on true dead center regardless of out-of-straightness or "whip" in the stock. The gadget is particularly useful on the second operation step of drilling the center hole in the cut-off end of the stock because no internal backstop is needed inside the collet to position the stock.

The tool is simply and easily made. A combination drill and countersink is mounted in a carefully

ored hole in the shank of the tool. It is retained y one or more cup point setscrews seating on the ody of the drill.

The nose of the tool is carefully threaded concentric with the bored hole. A hardened steel cap s made up as shown and is threaded up tight to the shoulder on the threaded end of the body. The ored hole in the nose of this cap is grounded out o a slip fit on the particular size of stock being nachined. The cap is hardened for wearability on the inside diameter where it slides onto the stock. Various nose caps can be made to suit different stock sizes and can be interchanged on the same shank.

When in use, the end of the piece of stock will seat up on the end of the shank to regulate the depth of the hole. If depth of the hole is to be changed it is simply a matter of moving the drill axially and relocking it. Radial holes are provided in the periphery of the nose cap to aid in chip disposal. The operator should blow chips out with compresed air frequently also. This device has been especially helpful on long-run production work.



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Punch and Die for Assembling Oil Seals

Tooling for press assembly operations, such as the dies for forming the retaining flange of oil seals, usually involves special features. Of particular interest in the die illustrated is the spring-actuated plunger which is the key to the operation.

The oil seal consists of a drawn sheet metal cup or shell, a leather or rubber seal, a retainer cup for holding the seal in position, a coil spring and washer. The parts are assembled by hand and placed in position on the die.

When the press ram descends the coil spring in the punch holds the plunger in bottom position so that it makes contact with the oil seal washer and shoves it down in place. The coil spring in the seal under the washer is forced down on the outside of the slightly tapered seal at the same time. Thus all parts are held for proper assembly. As the press ram continues down the punch coil spring is compressed and the rolling punch curls over the flange of the oil seal to permanently hold the assembled parts. This tool has been in operation a long time, assembling several hundred thousands of such seals yearly.

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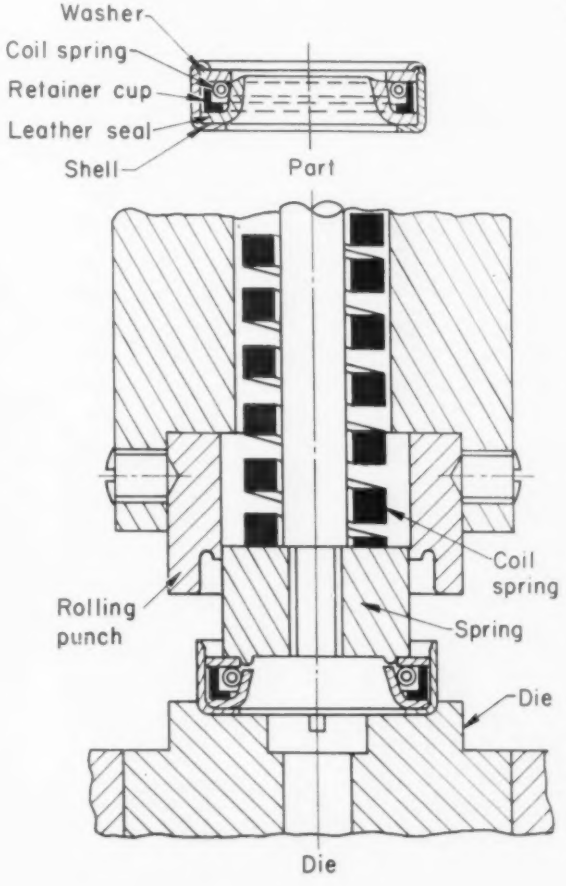
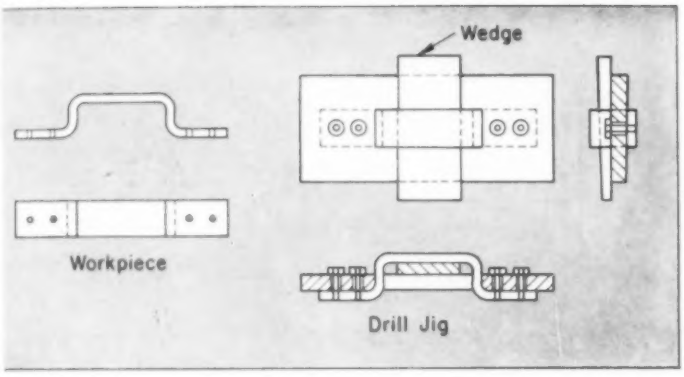
Upplands Vasby, Sweden





Inexpensive Drill Jig

In a part made from cold-rolled steel, as shown in the accompanying sketch, it was necessary to drill four small holes. They could not be punched because their diameter was too small with respect to the material thickness. Also, it was a comparatively short run with rather ample tolerances; the important feature was accuracy of the center distances of the four small holes.

The drill jig used is simple and inexpensive. It consists of a plate and a wedge. The plate is cold rolled steel with an opening in the middle that is a sliding fit with the central U-shaped section of the workpieces. This opening serves to locate the part in relation to the four standard drilling bushings in the jig plate. These are standard, interchangeable bushings which are reusable after completion of the order.

In operation the workpiece is placed into the opening and a wedge is driven between workpiece and jig plate. A soft hammer should be used for driving the wedge in and out to avoid peening the edges.

The part is drilled by placing it on its feet on the drillpress table without the necessity of clamping it to the table. This gives a faster operation as does the speed and simplicity of loading and unloading the jig.

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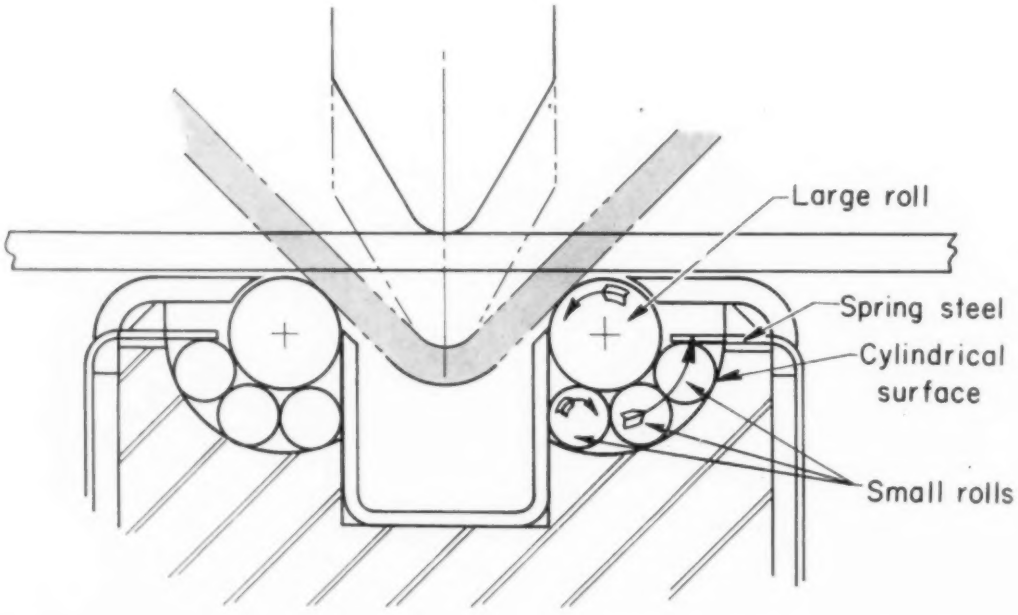
Press Brake Design for Magnesium

To overcome problems of press brake forming magnesium the design shown in the accompanying sketch was devised. With this mechanism there is no rubbing action anywhere while the material is being bent. The large rolls rotate with the material as it is being drawn down into the die. The small rolls rotate in the opposite direction, tending to move up the cylindrical surface as indicated by the arrow. The retainer angle for the small rolls being of spring steel returns them to their initial position when the punch of the brake is withdrawn.

Alfred E. Blatter
San Diego Chapter



Die Castings for Machine Parts

By David Laine
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DESIGN CHANGE-OVER to die-cast machine components is resulting in lower weight, reduced production and lower assembly costs because of the one-piece construction inherent in the die-casting process. Smooth surfaced functional parts of zinc or aluminum die castings meet requirements for impact resistance, close tolerances and appearance.

The following examples indicate what can be done with die castings to improve construction and operation of machines, and illustrate production advantages that can be gained. They show how complex parts, involving intricate undercuts, cored holes and curved sections, can be die cast to required accuracy and with a minimum of secondary operations.

Recently redesigned to modernize its appearance, and increase its ease and safety of operation, the Shopsmith, manufactured by Magna Engineering Corp., combines many production methods and materials with sound die-casting methods. This machine has an unusual quill that can be moved to and locked in any longitudinal position. The quill is moved by a feed gear.

This gear is a zinc die casting and it must be attached to its shaft in such a manner that it can resist torsion loads imposed by quill operation and axial displacement required to clamp the gears that lock the quill. The zinc gear, $1\frac{9}{16}$ inches long and $2\frac{1}{8}$ inches in diameter, is die cast around the $\frac{1}{4}$-inch steel shaft. Several slots are milled crosswise in the shaft, *Fig.* 1, where the gear is to be cast. These slots provide a positive bond between the casting and shaft so that torsion and thrust can be resisted.

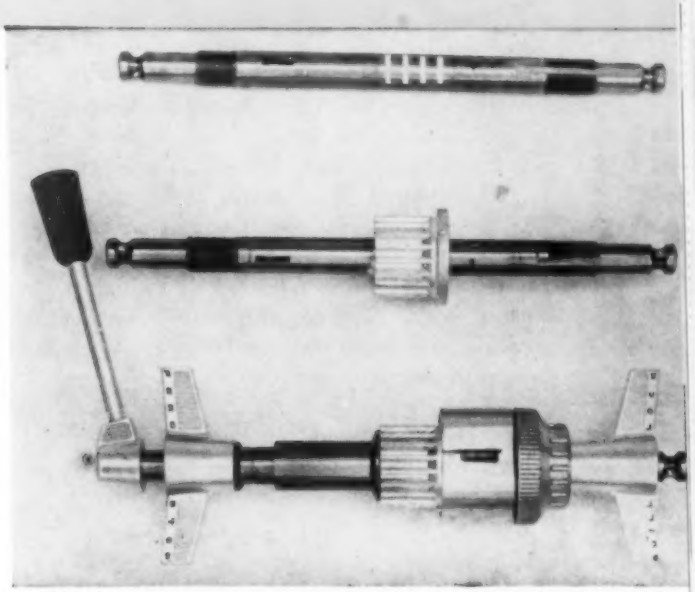


Fig. 1. Steps in the production of the quill feed for the Shopsmith. After slots are milled in the shaft, the feed gear is cast on. The pinion and the collar that partially overlaps it are zinc die castings.

Main core of the quill feed assembly, the 12 inch long shaft is actually an insert in the cast gear. The die-cast pinion replaces a machined steel gear that was shrunk onto the shaft.

Two problems of close tolerances were solved in die casting the feed gear. The gear portion of the casting, which is $1\frac{1}{4}$ inches long, has to be cast with a maximum total draft of 0.004 inch and the outside circumference of the gear has to be concentric with the circumference of the steel shaft so their centers are not more than 0.004 inch apart.

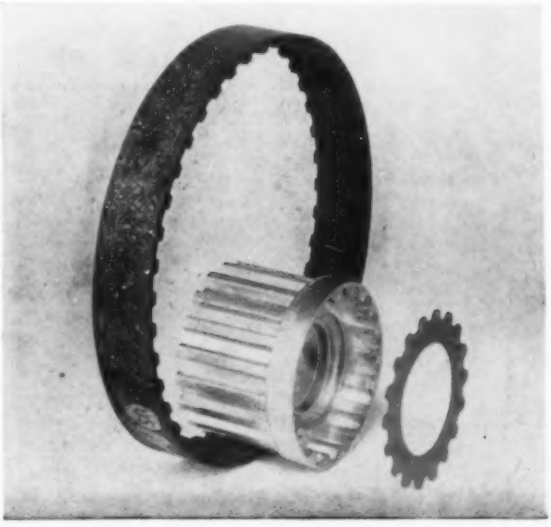


Fig. 2. Close tolerances and smooth surfaces of this die-cast collar spline pulley permits speeds as high as 5200 rpm without damage to the timing belt. A typical stamped friction plate is at right.

Feed gears are formed in a conventional horizontal die-casting machine with a die movement of about 10 inches. To accommodate a 12-inch insert, the die was designed to accept the shafts parallel to the die parting surface. At the same time, provision had to be made for holding the required concentricity. The die has two cavities and is made with a movable block across the width of the die. The block carries pinion cavities as well as two long close-fitting bushings to receive the shafts.

Actuated by automatic pushpins when the die opens, the entire block moves above the parting line of the ejector die half. Castings are manually ejected out of the cavities by rack and pinion. The gate is a single runner instead of the usual concentric shape. Castings are ejected without the necessity of clearing the movable cavity block over the top of the sprue post.

Tooling was made and parts are produced by a Los Angeles job-shop die caster. Cavities were hobbed and given a carburizing heat treatment.

The quill of the machine can operate at any speed between 700 and 5200 rpm. Variable speed is achieved by variable-pitch pulleys and power is transmitted to the quill from the second pulley by a timing belt. The timing belt is supported between two zinc die castings. The die used has two cavities for each part and is run on a hot chamber machine.

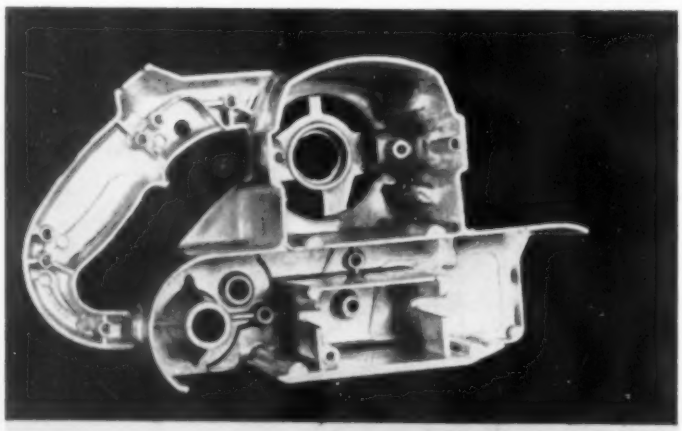
Formerly a powder metal part, the collar spline pulley, *Fig.* 2, is basically a gear within a gear. The gear portions are both cast with a maximum total draft of 0.004 inch and they are concentric so their centers are not more than 0.006 inch apart. Concentricity does not depend on the four guide pins aligning the die halves. Instead, opposite cavities of the die are piloted into each other to a depth of $\frac{5}{16}$ inch. In operation, the external gear of the collar pulley engages a timing belt and the internal spline accepts a set of friction plates.

Many features of heavier equipment are duplicated in a ten-pound, three-inch belt sander, manufactured by the Porter-Cable Machine Co. It achieves light weight through use of an aluminum die-cast housing, *Fig.* 3, which is a combination handle, motor housing and belt frame. Each section of this one-piece casting is separated by thin walls and is intricately cored for precision assembly of the unit's components. During assembly, the motor, bearings, gearing, switches, drive linkage and wiring are inserted in this close-tolerance die-cast frame. This aluminum 380 alloy die casting has minimized housing assembly costs.

Vital to the high-speed operation of a 14-inch wood-cutting band saw are several zinc die castings. Capable of handling stock over one foot thick, this machine, produced by Delta Power Tool Div., Rockwell Manufacturing Co., moves the band at 2200 fpm. Through use of die castings at critical points, accuracy is built into this machine.

Two zinc die-cast trunnions, *Fig.* 4, give the table extra rigidity during heavy cuts. The table-tilting mechanism is completed by an intricate die-cast bracket that mounts between the trunnions and is attached to the main machine frame. The bracket die casting contains curved and straight secions, and complex coring. To duplicate this part from bar stock would be considerably more expensive. Both upper and lower blade guides, and a one-piece lamp shade are also die cast of zinc.

These examples indicate the extent to which die castings are being used and suggest greater future use where accuracy and complexity are involved.



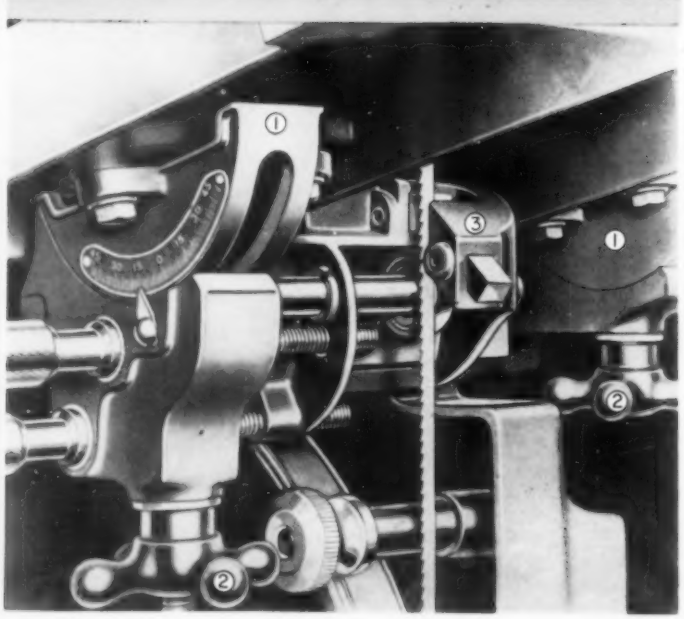


Fig. 3. (Top left) Light weight and reduced assembly costs result from use of this aluminum die casting for the housing of a portable belt sander.

Fig. 4. (Left) Zinc die castings in a 14-inch wood saw table-tilting mechanism include: trunnions (1), control handles (2) and the trunnion mounting bracket (3).

wet machining of cast iron increases tool life

By John A. Boyd
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Fig. 1. Cast iron can be machined without the need for exhaust systems as shown in this operation at the West Pullman Works of International Harvester Co. This seven-way drill press operates with a cutting fluid and has satisfactory tool life.

WHEN MACHINING CAST IRON in the past, there have been three procedures from which to choose: machine dry and have dust problems, machine wet and lose tool life, and machine dry and install an expensive dust exhaust system. As a result of recent developments in water-soluble compounds, there is a fourth possibility: machine wet and extend tool life, *Fig.* 1.

The relatively large percentages of carbon in cast iron create a brittle structure and, in machining, cause the metal to fracture ahead of the tool. Continuous chips are not present and there is no need for the type of lubrication required by the more ductile alloys. In fact, lubricants used on alloy steel can be detrimental to tool life if used when machining cast iron.

Twenty years ago it was universal practice to machine cast iron dry. Tool life was excellent. However, machine speeds have steadily increased and have resulted in the creation of large volumes of fine dust, which represents a health hazard. Such dust can be removed by exhaust systems that can cost from $200 to $2000, depending on the type of machine and its requirements. In addition to high initial and maintenance costs of such exhausters, the hoods frequently interfere with tool replacement and make machine setup difficult.

Since the trend in automotive manufacturing plants has been toward continuous machining operations, this industry has pioneered toward an answer to the dust problem. General specifications set up by the industry indicated the need for a wet system that would make easy the problems of sludge and chip disposal. Also, a desirable wet system would act as a tool lubricant and extend tool life.

When standard cutting oils failed, light-viscosity mineral oils and kerosenes were tried. These fluids also carried the fine cast-iron dust, in suspension, back to the point of cut and tools were abrasively lapped. Tool life was reduced and these fluids were abandoned.

With soluble oils, tool life was better but still not as good as when machining dry. In addition to the

Fig. 2. Section of pipe cut from a system in which a conventional soluble oil was used as the coolant. Chips have packed in the pipe to restrict the coolant flow.

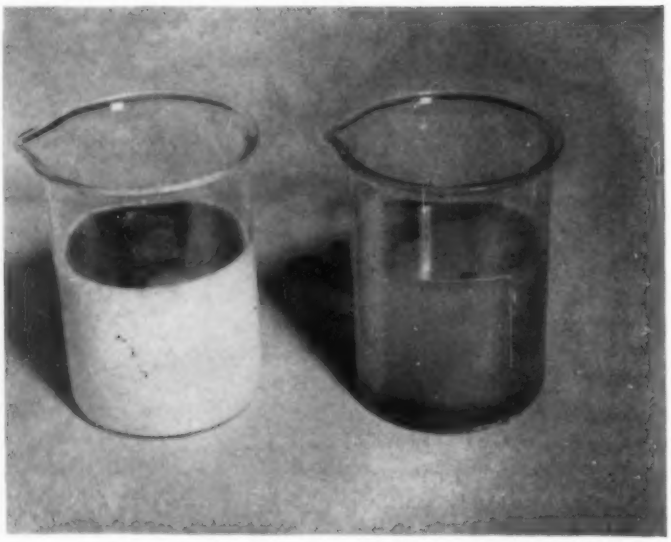

Fig. 3. Cast-iron chips float on a conventional water-soluble coolant, left, but immediately settle out of the high-wetting and dispersing soluble because their surfaces are wetted.

loss in tool efficiency, soluble oils resulted in clogging of the coolant lines. Cast-iron chips would pick up oil from the water soluble and then mat into spongy masses that clogged working surfaces of the machines and the elbows of coolant return lines.

Efficient operation of the machines was hampered when soluble oils were used. Cast-iron chips clogged the collets, prevented proper clamping of parts and led to excessive collet breakage. Machine operators stored strong bristled brushes by the machines, stopped 15 minutes early each day and cleaned the machines to keep them operable. Some companies tried to solve line clogging problems by installing larger lines, but a three-month respite was all that was achieved with huge lines, *Fig.* 2.

Carry-back of chips with regular water solubles also caused problems of tool abrasion. Soda ash and water solutions were tried in order to avoid tool abrasion by dropping the chip from the solution. However, rust became a problem, and dehydrated soda ash deposits on the machines and fixtures created severe maintenance problems.

The best current solution to cast-iron machining problems is the use of a high-wetting and dispersing water soluble with special rust-inhibiting additives. Prime requirements of a water soluble compound for cast-iron machining are:

1. Finely dispersed transparent emulsion that will prevent oil from clinging to the chip.
2. Wetting properties that will drop the chip from solution and allow it to settle in the tank.
3. Rust preventing properties.
4. Detergency to maintain clean lines and keep machine working areas free of mineral oil.

A good tool lubricant must meet all these requirements and, in addition, be nonfoaming and noninjurious to operator's hands. With such a fluid, wet machining of cast iron becomes feasible. With volume machining, a wet system is necessary so that chip drag-out and handling can be accomplished by conveyors. Neither dry machining nor dry machining with a dust exhaust system can equal the low costs and good results obtained by using a good washing soluble.

One plant, using a standard water soluble cutting fluid developed for alloy steels, found that reamers twisted off after cutting three cast-iron pieces. Chips matted in the flutes of the reamer and caused breakage. Dry machining could not come within specified size limits for the tapered holes. A new soluble, meeting the previously outlined requirements, gave such good results that the company switched to it even though an exhaust system had just been installed.

In another plant, the new type coolant prevented rusting for days while machined parts were stored prior to phosphate coating. A previously used water soluble had induced rusting within 30 minutes after the part left the machine.

Large increases in tool life have also resulted from use of the new coolants. In a plant that was turning cast iron on a 12-spindle vertical lathe and obtaining 100 pieces per tool sharpening, introduction of the new compound resulted in an increase of tool life to 375 pieces per sharpening. Also, line clogging, which had been a problem in this plant, was prevented. Tool life gain is achieved because the chip drops out of solution, *Fig.* 3, and prevents abrasive action.

company standards *cut cost of carbides*

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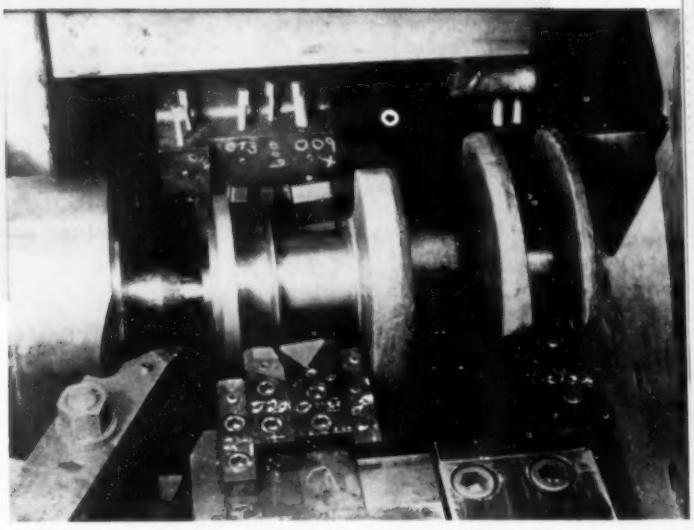

Photo courtesy Wesson Co.

Fig. 1. Carbide cutting tools are a vital element in making automation of many operations feasible.

STANDARDIZATION is an increasingly important factor in reducing costs of plant operations. Companies that have utilized standardization of supplies, tools, materials and machine components have thereby secured many savings. Two prevalent conditions have made standardization of tools imperative: (1) the multiplicity of special tools designed or requested by company personnel; (2) the wide variety and assortment of tools offered by suppliers.

These conditions have been intensified by the widespread adoption of carbides, *Fig.* 1, with their comparatively higher costs. Many companies live with the burden of thousands of different tools in inventory, enormous stocks of obsolete tools, a great number of special tool drawings, dependence upon a limited number of tool suppliers and excessive costs in the cutter grinding department or toolroom.

While standardization is unable to completely eliminate these problems, it does minimize them by reducing hundreds of special items to perhaps a dozen standard ones. Tool standardization on a national level has been rather haphazard in the past. Many tool standards have been created by need and extent of usage without official sponsorship. Typically a tool manufacturer lists in his catalog the items in greatest demand. These are made in large quantities, kept in stock and sold at reduced prices compared to unstocked (nonstandard) tools. The main difficulty with such standardization is that common nomenclature and common tool numbers are lacking. Also, there are variations in sizes and shapes from one supplier to another.

Efforts are being made to correct this confusing situation by such groups as Joint Industry Conference (JIC), manufacturers' trade associations, and technical societies working in cooperation with the American Standards Association. An example of results of such efforts is apparent in the standard carbide boring tool, *Fig.* 2. This design was developed after an exhaustive study of detailed tool drawings of 14 tool manufacturers by such a standardization group, and required nearly a a year of intensive effort. In addition to differences in designations, 60 differences were found in size, shape, tip size, tip shape, tip thickness, height above center, dimensions and tolerances. These variations were resolved to a single tool size and shape acceptable to tool manufacturers and tool user groups. A portion of the standard for the 5/16-inch

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tool is shown in *Fig.* 3. An example of a typical tool designation, for instance TSC-5, is as follows:

Tool Symbols	Designation
T	Tipped
S	Square
C	30 deg side cutting edge angle
5	5/16-square size

Significance of the complete standard designations is shown in the chart appearing in *Fig.* 4. It is expected that this tentative standard will soon be issued by ASA as an industry-wide standard.

Another advantage of tool standards is exemplified by insert toolholders. While a dozen different manufacturers make this item in as many styles and designs, they nearly all conform to the same dimensional outline so that they are interchangeable. The problems that would be encountered with production machines can well be imagined, if they had to be retooled merely to change over to another type of toolholder.

There are many other advantages to be gained by individual companies through the use of tool standards. For instance, standard tools are readily available from many different sources and can be secured on short notice. On the other hand, special tools may require from 6 to 12 weeks' delivery time.

Uncertain or unpredictable usage in the shop usually requires that up to a 90-day supply be kept on hand. Excessive shop usage, engineering changes, cancellations or stretch-out programs may result in costly machine down time for lack of tools or an expensive stock of obsolete special tools. Again, this possibility is avoided by use of standard tools. Another advantage is that standardized tools are interchangeable for many different jobs. New tool requirements can often be drawn from existing stocks when a new job or process is begun.

Replacing special tools with standard ones will eliminate much paperwork in the store crib, tool control, purchasing and accounting. Thus, considerable paper processing time can be saved. The reduced volume and space requirements in the crib, *Fig.* 5, result in less confusion and possibility of error, as well as improved efficiency in maintaining accurate tool control.

Tool control activities should have the responsibility of reviewing all new tool requirements on new processes or tool layouts submitted by machine tool suppliers. Objections may be raised to efforts at standardization by the process engineer or the machine tool builder whose basic interest is to be certain the part can be machined with minimum effort. Too often, the inclination is to specify a special tool. Before this answer is accepted, a diligent effort should be made to ascertain if the special tools cannot be replaced by standards. From an over-all cost basis, the additional investigation required is more than offset by savings secured over life of the machine or process.

Since many special tools are basically standard tools with minor modifications, many plants purchase and stock standard tools and modify them in their own shops as required. This eliminates pur-

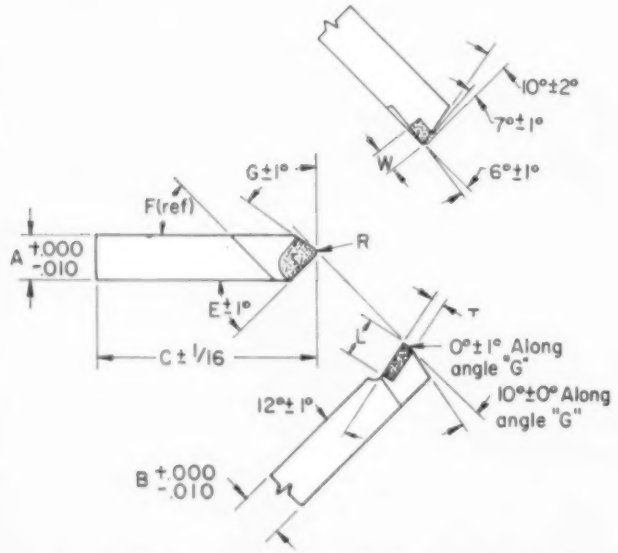


Fig. 2. Tentative standard carbide-tipped boring tool. Dimensions are given in *Fig.* 3, and designations of different styles in *Fig.* 4.

Fig. 3. Dimensions for style TS boring tool (5/16-inch square shank), tentative standard.

TOOL DESIGNATION	BOR. BAR ANGLE FROM AXIS, DEG	SHANK DIMENSIONS				SIDE CUTTING EDGE ANGLE E, DEG	END CUT EDGE ANGLE G, DEG	SHOULDER ANGLE F, DEG	TIP No.	TIP DIMENSIONS		
		WIDTH A	HEIGHT B	LENGTH C	NOSE RADIUS R					THICK T	WIDTH W	LENGTH L
TSA-5	90	5/16	5/16	1 1/2	1/64	0	8	90	2040	3/32	3/16	5/16
TSB-5						10						
TSC-5	60					30	38	60				
TSD-5						40						
TSE-5	45				± .005	45	53	45				
TSF-5						55						
TSA-6	90	3/8	3/8	1 3/4	1/64	0	8	90	2040	3/32	3/16	5/16
TSB-6						10						
TSC-6	60					30	38	60				
TSD-6						40						
TSE-6	45				± .005	45	53	45				
TSF-6						55						
TSA-7	90					0 - 10	8	90				

Side Cutting Edge Angle		Boring Tool Styles			
Degrees	Designations	Solid Square (SS)	Tipped Square (TS)	Solid Round (SR)	Tipped Round (TR)
0	A		TSA		
10	B		TSB		
30	C	SSC	TSC	SRC	TRC
40	D		TSD		
45	E	SSE	TSE	SRE	TRE
55	F		TSF		
90(0°Rake)	G				TRG
90(10°Rake)	H				TRH

Fig. 4. Designation of carbide boring tools, tentative standard.

chasing and stocking many new special tools. It must be recognized, however, that when there is a mass production item that requires consumption of large quantities of tools, say 200 or more per month, it may be better to use a special tool. This is especially true if there are production advantages to be gained. Also, such tools may be purchased in these quantities at as low cost or sometimes lower than that for standard tools.

Another possibility to be considered is the purchase of unfinished standard tools that can be used for modification, such as milled and brazed single-point tools. This plan will show savings if there are large quantities of tools involved and if adequate grinding facilities are available. In the cutter grinding department, the use of standard tools will facilitate operations. Special drawings, highly skilled labor, multiple setups and short runs of tools are eliminated, resulting in greater efficiency and cost reductions. Delays in the grinding room which hold up production while special tools are reground, are also largely eliminated. Even incoming inspection will save by reducing time spent on inspection of special tools.

Expensive design time will be saved in the tool design department by eliminating trial and error redesign of special tools. Tool design should consider standard tools first. If necessary, they can then be modified or converted into specials. The tool design department should also avoid specification of a specific supplier's material or design as part of the tool, such as type of finish. This principle will eliminate stocking of the same tool in different categories. The practice of specifying specific supplier materials as opposed to standard materials can cause as much difficulty as specification of special tools. Specification of special parts or materials sometimes occurs in the tool design department primarily because design personnel fail to appreciate the problems created by this practice.

While few suppliers' catalog standards vary from industry or JIC standards, nevertheless if a tool is specified from a catalog, it should be checked to determine that it conforms to the industry standards. Otherwise, procurement is limited to a single vendor. Such tools may not be competitively priced or readily available for short delivery when required.

When a tool is specified from a standard sheet, it can be procured with only a standard tool designation number. Drawings are unnecessary. Tool vendors can be supplied with copies of company standards. With many large firms, they are familiar with the company standards as well as available industry standards.

Nontechnical or design personnel may be unaware that competition has reduced cost of standard tools to a low basic price, because such tools are produced in large quantities. Thus a special tool, though similar to a standard tool, may cost from 3 to 10 times more. Indeed, in a large company the combined advantages secured from purchasing and using standard tools can, over a period of a year, amount to hundreds of thousands of dollars' savings. Taxes, handling, storing and scrapping of obsolete special tools waste substantial amounts of money.

Since standard tools and those modified from standard blanks are uniform, shop personnel will usually find their performance uniform. Specials, on the other hand, have a habit of performing inconsistently. This may be due to use of varying grades of tool materials, minor variations in size, shape or grinds, and variations in quality. In any event, tool life and tool breakage are inconsistent, giving rise to numerous other troublesome problems that arise due to such conditions.

Finally in a firm with several divisions, some of which may be scattered widely, standardization

—Photo courtesy Standard Pressed Steel Co.

Fig. 5. Standardization of tools is evident in this well-ordered layout. Many benefits result to the shop by reduction in crib tool inventory.

makes possible the exchange and use of each other's standard tools. Obviously, this can reduce tooling time and production delays.

In any discussion of the use of standard tools, the disadvantages which may result should also be considered. Certain types of manufacturing operations which result in numerous changes in shop practices, many engineering changes, rapid changes in models or styles of the product which require new tooling, or small run operations are difficult to accommodate to tool standardization. Such plants, however, should utilize available industry standard tools to the fullest. These tools should be universally applicable, that is to most machining operations, and so reduce danger of early obsolescence.

Too much importance cannot be placed upon emphatic, active and direct support of top management in the installation and use of company tool standards. A halfhearted attempt to drag a standardization program into a plant without active and wholehearted cooperation of other affected activities may prove both troublesome and expensive as well as lead to confusion and misunderstanding. A standardization program must be carefully planned and tailored to meet existing requirements and future expansion. It is best to start with a few simple operations which will show immediate and obvious improvement. Cooperation and support will be gradually forthcoming.

The paramount concern of all personnel responsible for introducing a standardization program must be that it prove beneficial and helpful to the company. There must be no interference or complications of existing activities. The program must be developed on its own merits as it is something which cannot be forced even on the basis of directives from top management.

Standards, of course, must be applied judiciously. A rigid adherence to standard tools in all instances may discourage inventiveness and ingenuity in tool designers. This may prevent desirable improvements in cutting tools in instances where shop operations could be improved. Also, tool standards should not prevent consideration of a type of tool which may be newly developed. In such an instance, the company may lose by too strict an insistence on adherence to standard tools, especially if the new tool is definitely superior.

While each individual company must consider standards in the light of its own operations, there are some general suggestions and recommendations that can be offered. An example of an excellent company tool standard is illustrated in *Fig. 6*. Existing standards should first be compiled and reviewed so that those which are irrelevant to the company's operations can be segregated. When an industry standard is adopted for a company standard, it should be applied without change. Though it might be improved or might fail to meet exact requirements, any changes would defeat the purposes of the program. Where industry standards must be altered to fit individual requirements, changes should be clearly indicated and different tool classification numbers applied.

Tool standards developed by other firms should be secured. Requests for company standards are usually welcome and honored, as it is to the advantage of all firms to further the use of their standards. Whenever possible, identical tool classification numbers should be used for the same tool to insure uniformity. This also applies to the sketch or drawing, dimensions and tolerances of the tool.

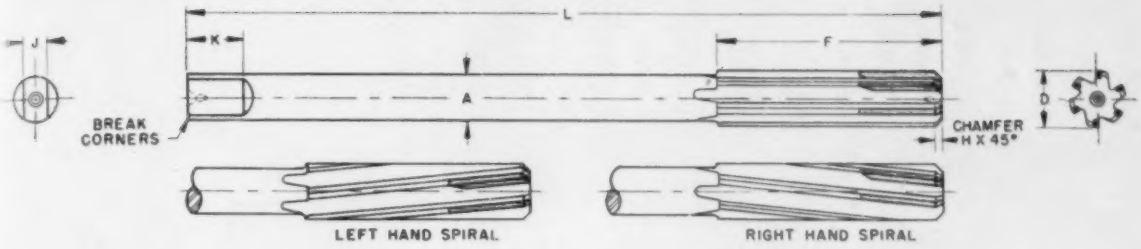
Many large organizations such as Ford Motor Co., Chrysler Corp., General Motors Corp., International Harvester Co. and Caterpillar Tractor have facilities for reproducing their standards and will furnish them to any legitimate requester. In addition, such companies exchange new standards. Most tool suppliers likewise have copies of these company standards. Often, there is a nominal charge for these standards which includes mailings of new standards as they are released. Visits to several companies now using tool standards to investigate practices and experience can prove to be worthwhile.

Tool suppliers often are willing to assist in preparation of company tool standards and may have considerable experience in the field. However, care should be exercised to avoid confining the resulting standard to a single supplier's tool, as this nullifies the original purpose.

One of the first steps in the preparation of company standards is the formation of a committee with subcommittees responsible for actual work of prep-

REAMERS

STRAIGHT SHANK MACHINE REAMERS
CARBIDE TIPPED



NOM SIZE	STANDARD TOOL NUMBER RIGHT HAND CUT			NUMBER OF FLUTES	DIAMETER				LENGTH		TANG			CHAMFER H	STANDARD TOOL NUMBER OF CARBIDE TIPS (SEE GROUP TC1)
	STRAIGHT FLUTES (1)	SPIRAL FLUTES RIGHT HAND (2)	SPIRAL FLUTES LEFT HAND (3)		REAMER D MIN	REAMER D MAX	SHANK A MIN	SHANK A MAX	OVERALL L	FLUTE F	THICKNESS J MIN	THICKNESS J MAX	LENGTH K		
1/4	TR1-108-C	TR1-208-C	TR1-308-C	4	.2501	.2504	.2324	.2339	6.00	1.50	.118	.122	.31	.03	RT-1
9/32	TR1-109-C	TR1-209-C	TR1-309-C	4	.2813	.2817	.2324	.2339	6.00	1.50	.118	.122	.31	.03	RT-1
5/16	TR1-110-C	TR1-210-C	TR1-310-C	4	.3126	.3130	.2792	.2807	6.00	1.50	.158	.162	.34	.03	RT-1
11/32	TR1-111-C	TR1-211-C	TR1-311-C	4	.3438	.3442	.2792	.2807	6.00	1.50	.158	.162	.34	.03	RT-3

Material and Heat Treatment

Material: Reamer Body—M 9920B (W10)
Heat Treatment: "Q" Quench in Oil
Rockwell Hardness: "C" 40 Minimum

Example for Ordering (TR1-110-C)

T—Tools
R—Reamers
TR1—Group
1—Straight Fluted
10—Size of Reamer in Number of 32nd's
C—Carbide Tipped

Fig. 6. Well-planned company tool standard—a decided improvement over haphazard use of specials or commercial catalog standards.

aration of standards. Each standard can be assigned to a subcommittee consisting of company experts on the subject and representatives of affected activities. The main committee should consist of representatives from related departments such as purchasing, stores, manufacturing, tool design, product engineering when necessary, production engineering, tool supervision, toolroom supervision, metallurgists, etc. Such representatives should be at department head level. When there is more than one division in a company, representatives from each division should be present. The committee should meet often enough to keep the program active and current.

Subcommittees should investigate all aspects of a standard, especially problems which may be encountered, to determine the best solution through application of the most appropriate standard.

Complete tentative standards should be circulated to all interested departments and personnel for comment and approval. The standard can then be revised, if necessary, before being submitted to the main committee for approval and publication. Since relatively few people, especially in a large organization, are familiar with standards, their uses, purposes and advantages, the management must devise means of promoting the program. This may consist of educating plant personnel in the same manner as with a safety program.

To make standards available, it is necessary to develop a permanent format, numbering system and logical organization so that future expansion is possible and revisions can be easily made. The best features can be picked from a number of other companies' standards and combined to suit company requirements. Tool numbers specified in company standards should be self-identifying wherever possible, *Fig.* 6. Tools can be ordered in two ways—by the standard designations in the book or by tool classification number which is the industry's standard.

Distribution of the standards books should be as wide as possible without being wasteful. It can include both tool suppliers and companies from whom standards are received in exchange. For control purposes, it is usually desirable to number copies as issued. Revisions can be distributed by a method similar to that used for distributing drawing or engineering changes.

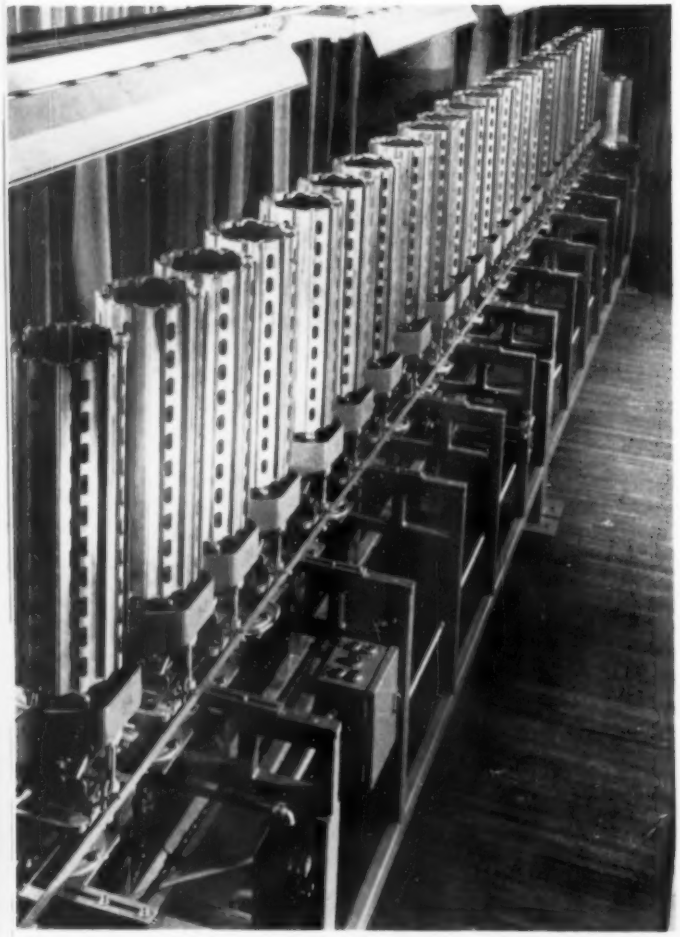
Standardization is a constantly changing field. Improvements, new tooling and other developments require changes in existing standards as soon as a tool is proved and accepted by industry and the need for standardization becomes apparent.

No standards program, no matter how well planned, conceived and executed can bear fruit unless it is properly used and supported. Those involved must know how to apply tool standards properly. There must be a constant follow-through and assistance given to all activities. This is the proper function of the standard department. Their attitude should be one of helpfulness and cooperation rather than coercion.

designed for

PRODUCTION

Machine Automatically Assembles Many Electronic Circuits

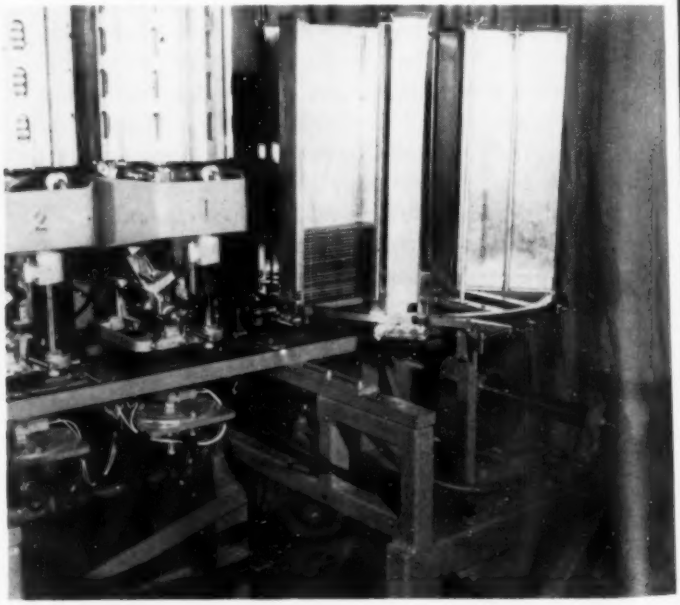


PRINCIAPL PARTS of the Autofab machine are a feeding mechanism (background) for printed circuit base plates, 24 attaching heads with controls and component feeders, a conveyor system, a positioning mechanism and interlocks to insure proper sequencing. Power is supplied by a conventional electric motor and shop air. All attaching heads are controlled by a camshaft and operate simultaneously.

DESIGNED for industrial use in automatically assembling electronic components, the first "Autofab" is being used to fabricate printed circuit subassemblies for large air defense computers. Designed by the Mechanical Div. of General Mills, Inc., Minneapolis, Minn., the first unit was purchased by International Business Machines Corp. who cooperated in the late development stages.

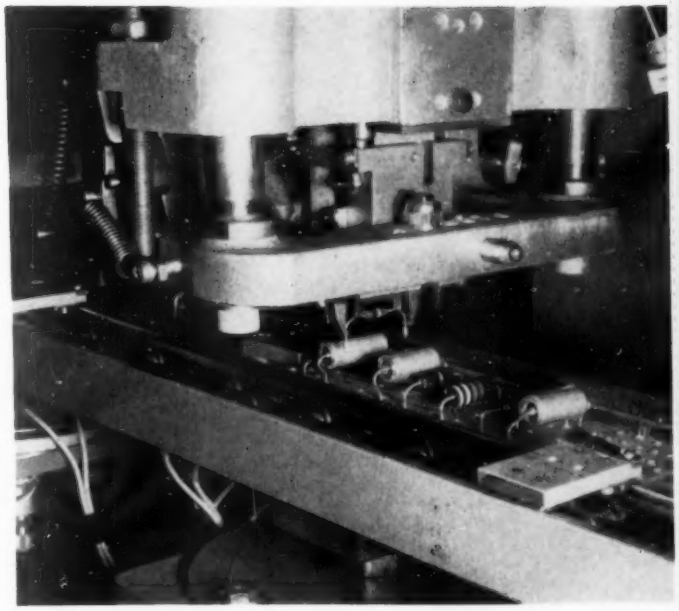
Most important feature of this machine is that

PRINTED CIRCUIT CARDS feed down onto the conveyor from the turret at right. The circuit card and component turrets all automatically rotate as a magazine or container empties, bringing full ones into operation. Empties then are refilled while the machine continues to operate. When any head runs out of parts, a warning light flashes on that head and the machine stops to prevent incomplete assemblies.



it has not been tailored for use with a single circuit. In fact, IBM plans to use the machine for assembling several hundred subassembly circuits. From 1 to 24 component attachment stations can be used and attaching heads, which are fastened by just two bolts and weigh only 25 lb, can be placed at any station. The machine will accommodate printed circuit cards from 2 by 2 to 10 by 10 inches.

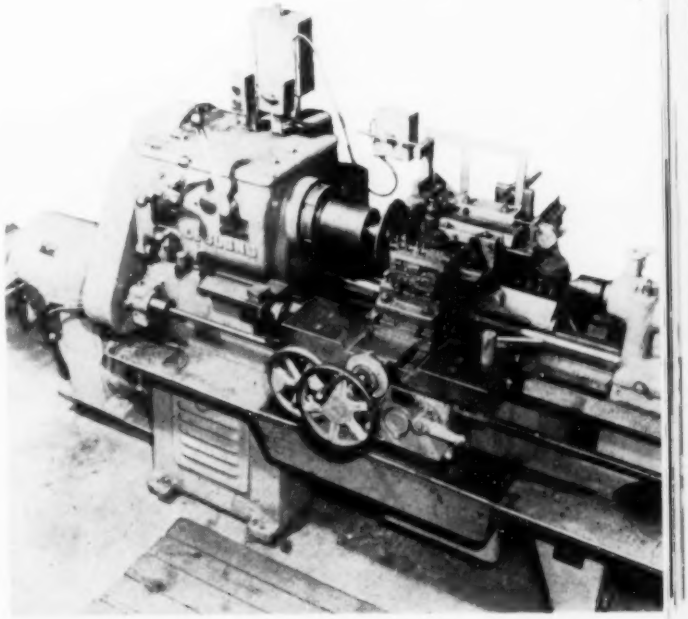
The basic machine can be operated by two operators and one supervisor who keep magazines full of components. Circuit cards are automatically positioned at the work stations by the same locating surfaces that are used when holes are drilled. Normal speed of the machine is 20 assemblies per minute.



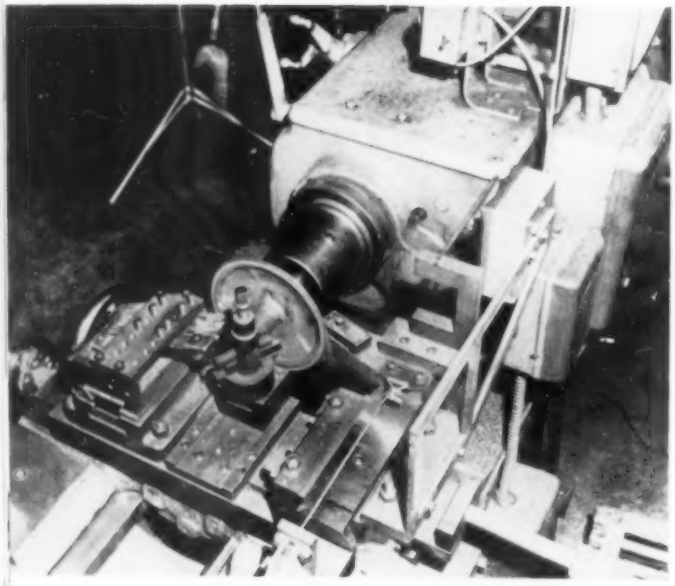
SMALL RESISTOR being inserted in a circuit card by an attaching head. The resistor leads are already bent to the proper spacing to match the card holes. Wrap-around sleeves on the leads result in off-the-board mounting but electronic components can also be mounted flush. There are no shock loads or abrupt changes in velocity imposed on cards or components. All attaching forces are applied directly to the leads. Components with double leads at each end can be handled easily. Polarized components such as diodes, capacitors and pulse transformers can be attached with proper orinentation because it is not possible to put magazines into turrets backward. A machine to prepare and load components is now under study.

Constant Cutting Speed Improves Angle Face Turning

SIMPLY by adding a variable-speed drive and associated controls, a standard engine lathe can be used for making facing cuts with a constant surface cutting speed. The Speed-Trol unit, developed by Sterling Electric Motors, Inc., Los Angeles, Calif., was applied, for example, to a LeBlond lathe for the finishing of angle surfaces on variable-pitch pulleys. Machining time on a large pulley, with constant cutting speed, is 4.08 minutes as compared to 5.85 minutes on a lathe limited to



ANGLE OF CUT is generated by cam action in the toolbox holder which moves the tool forward at the required angle as the cross slide is power-fed across the bed. A preset remote control station is mounted on a bracket rigidly fastened to the cross slide. A pinion on the control station dial spindle meshes with a rack connected to that part of the toolbox that moves forward during the cam-generated angle cut. Movement of the rack turns the control station potentiometer spindle counterclockwise and causes the lathe spindle to increase speed as the diameter of cut decreases.



the correct spindle speed for the largest diameter of the cut. The one speed-change drive gives the correct cutting speed for the outside diameter (15½ inches) of the largest pulley to the inside diameter (1⅝ inches) of the smallest.

Increments of decreasing diameter necessary to cause a speed change are controlled by the numbers of teeth on the rack and pinion of the control potentiometer. Increments are sufficiently small that the spindle changes speed almost continuously. Speed change by increment is imperceptible and there are no tool marks or other indications of speed change on the face of the pulley.

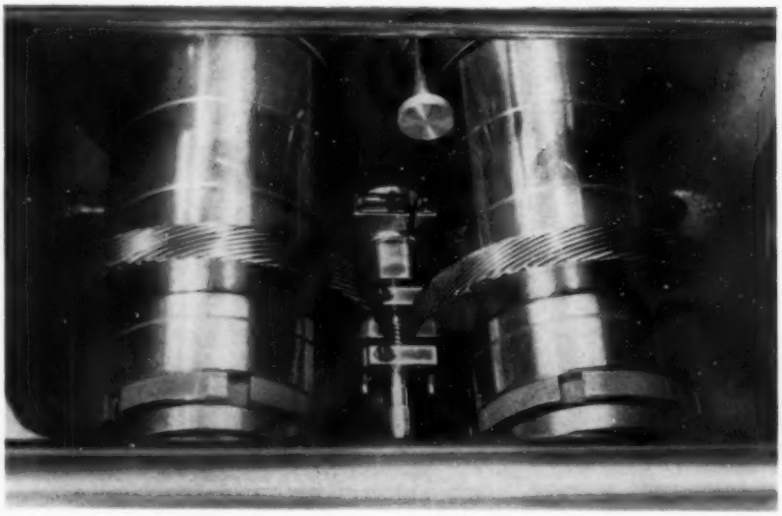
SECOND OPERATION of roughing the shank of the pulley is unrelated to the spindle speed requirements of the finishing cut on the angle face. A second potentiometer deactivates the first and adjusts the lathe spindle speed to a preset value that is suitable for the shank cut.

Thread Rolling Machine Designed for Setup Flexibility

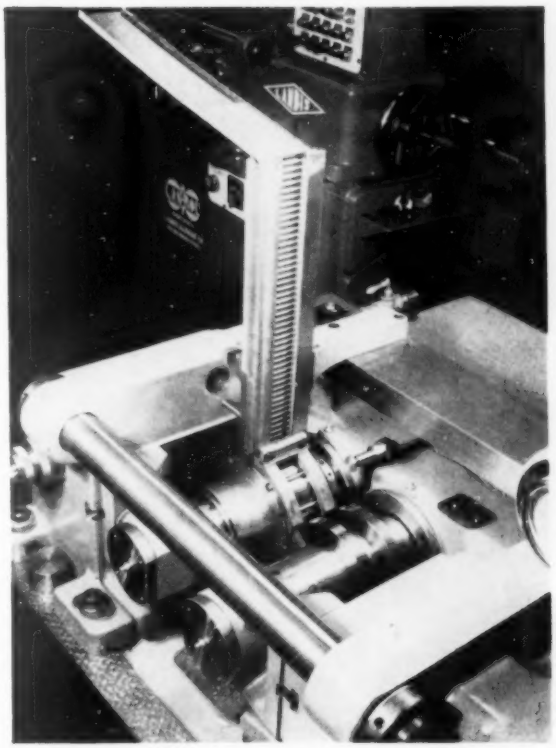
DESIGNED to produce strong, accurate threads, the Lanhyrol thread rolling machine cold forms threads quickly. Two thread rolls are used with workpieces supported on a workrest blade or in a holding fixture. This machine was developed and is produced by the Landis Machine Co., Waynesboro, Pa.

The machine features flexibility of setup so it can be used for infeed, through, continuous or reciprocal rolling. The hydraulic operating cylinder, which positions the right-hand roll during infeed rolling is designed to avoid overloading the rolls and machine if oversize or improperly heat treated workpieces are presented for rolling.

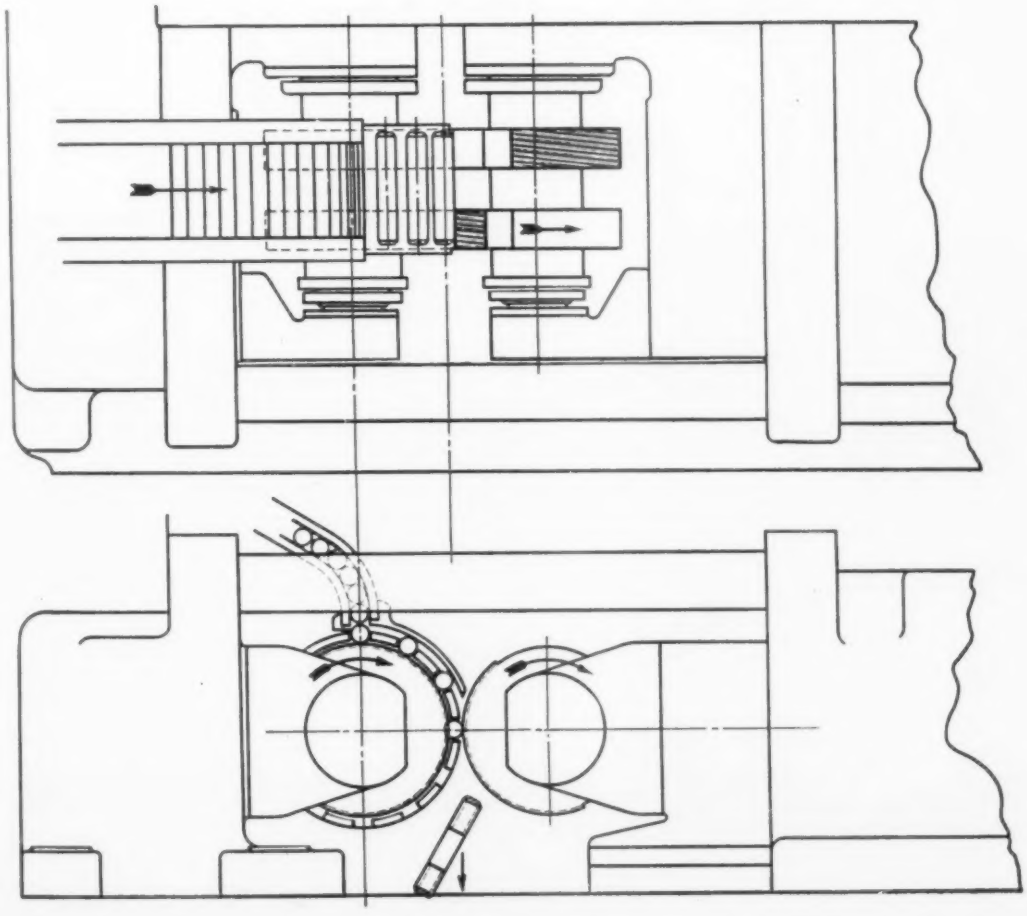
INFEED ROLLING of worm shaft for fractional horsepower motor forms ⅜-inch diam triple thread in carbon-alloy steel of 25 Rockwell C hardness at rate of 12 per minute. Workpiece is loaded manually into the workholding fixture with the right-hand roll and its movable housing retracted. As the machine cycles, the right-hand roll advances under hydraulic pressure to a prepositioned positive stop. The left-hand roll is mounted in bearing supports, stationary except for endwise movement needed to insure roll timing during setup. The right-hand roll unit automatically retracts when the forming cycle is complete so workpiece can be manually unloaded.



CONTINUOUS ROLLING of different threads on each end of a stud can be done automatically. For this type of operation, the rolls are maintained a fixed distance apart and two rolls are used on each spindle. Of segmental design, each of these four rolls features a thread form section and a blank section, blank sections allowing clearance at one end while threads are rolled on the other end. The workrest cage covers the rolls on the left-hand spindle. One end of the stud is rolled with a ⅜-inch, 16-pitch N.C., class 5 thread while the blank sections of the other rolls are in position. Upon completion of this thread, after about ½ revolution of the rolls, ⅜-inch, 24-pitch N.F., class 3 threads are rolled on the other end of the stud.



WORKPIECES are delivered from the magazine by gravity to the revolving workrest cage that indexes the double-ended studs into and away from the rolling position. Indexing is in timed relation to the completion of the stud, which occurs at each revolution of the rolls. By this arrangement, threads of different diameters and pitches, as well as with the same diameters, can be produced with a single pass through the machine.



Arc Welding for Small-Lot Production

Part I
Cost Considerations

By Arthur Allen
Cleveland, Ohio

Arc welding production in small-lot quantities involves critical analysis for tooling and setting up. This article discusses integrating welding with other production sequences, selecting the proper welding process and avoiding overwelding. Succeeding articles will discuss equipment and processes, and tooling the job.

Fig. 1. This welder constitutes a one-man factory for making gasoline tanks. He solders, assembles, welds, tests and inspects.

SETTING UP for arc welding in small-lot quantities involves the consideration of many factors to achieve economical production. The tool engineer should analyze the significant new developments in welding techniques, equipment and electrodes. Foremost among these, perhaps, is the trend toward making the welding operation a "machine" function, lessening the dependence upon individual skill and dexterity and with increasing speeds, improving quality and lowering unit costs.

Because of its inherent flexibility, low tooling cost and moderate capital investment, arc welding, *Fig.* 1, is ideally suited to the shop where production is measured in terms of, say, 20 to 500 units per day rather than the thousands scheduled by mass production industries. The problem becomes one of how best to apply arc welding to realize maximum potentialities and economies.

Shall welding operations be confined to a single department, with the product moved to and from it in the manufacturing sequence? Or shall it be integrated with the full production flow, along with presses, machine tools, assembly and finishing equipment? Both arrangements have their merits. Today, increasing preference is for integration.

Three suggested layouts of self-contained welding departments are shown in *Fig.* 2—small, basic and complete. The first does little more than actual

re welding and cleaning. It is hardly within the concept of production welding. The basic arrangement is capable of producing practically any design of weldment. The third and more elaborate plan can handle all weldments, in addition to performing specialized services, including a considerable degree of plant maintenance work.

Arc welding originally was confined to the maintenance or repair function, and it is only within the past 15 to 20 years that its capabilities as a production process have come into general acceptance. This has been due largely to more mechanization of the welding operation, development of better and less costly equipment and electrodes, evolution of standards for procedures, and accurate demonstration of the economies possible through use of welding as a joining method and through practical refinements in the design of weldments.

Referring to the three welding department layouts, space requirements are naturally an important consideration, but more significant is the proper evaluation of cost versus savings to be realized. The probable return on capital investment in abrasive cutoff machines, power hacksaws, shears, bending brakes, rolls, torch cutting devices, straightening and punch presses, cranes, trucks and conveyors must be figured along with that to be realized from the welding equipment itself.

Cost of any piece of equipment naturally must be justified on the basis of the savings it can bring in over-all manufacturing costs. An interesting nomograph, *Fig.* 3, can be used to determine the annual net return on capital invested in equipment if the potential savings from its use are known.

Where straight-line flow of material is dictated, and that is usually the case these days regardless of quantities involved, it frequently proves more advantageous to install welding equipment "on the line." Examples are numerous and are increasing steadily, even in plants where daily output may be only a few units. One which might be cited is that of railroad car shops where cars are built up progressively by both manual and automatic arc welding, moving from one station to the next, with fabricated sides, roofs and other structural elements being fed into a central line from each side, *Fig.* 4.

Even in the case of smaller assemblies, it is often possible to incorporate welders, particularly automatic or semiautomatic types, directly into the production line. It may even prove expedient to have operators handle other processing equipment in addition to the welding phase. Thus, at one point in manufacturing shafts, a lathe operator also runs a semiautomatic welder, *Fig.* 5. He machines the shaft, then moves the work to an adjacent welding station where he welds a small diameter shaft extension. The machined part is placed upright in a chuck which rotates the joint to be welded under the semiautomatic head from which elec-

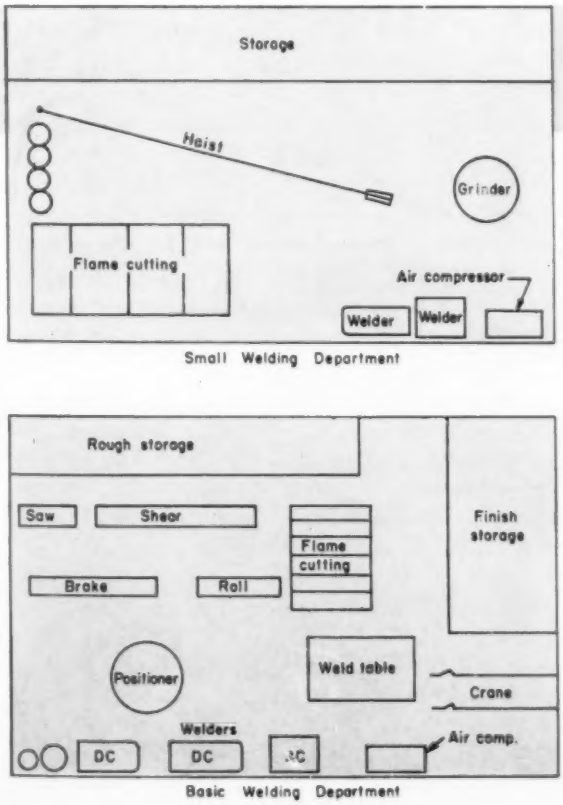
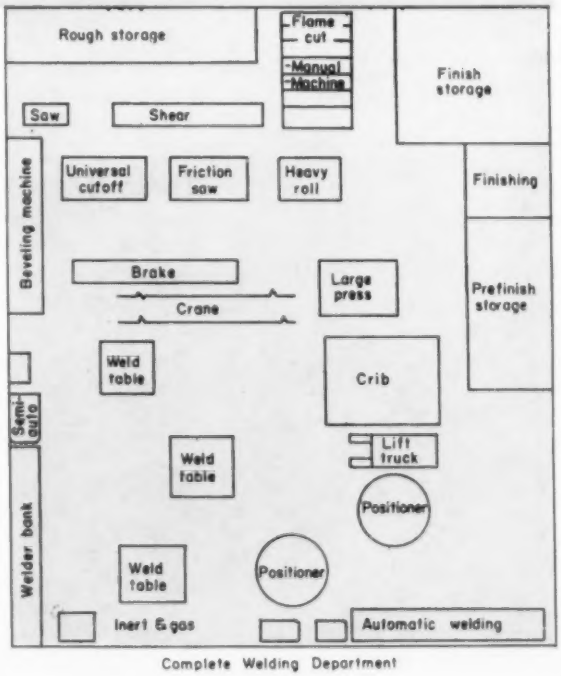


Fig. 2. Suggested layouts for three types of self-contained welding departments—small, basic and complete.



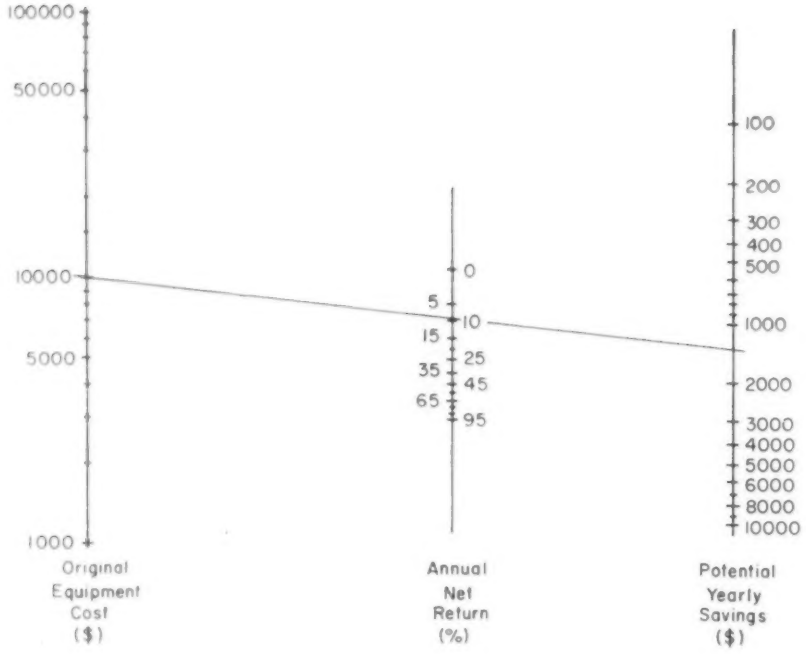


Fig. 3. Quick method for determining the rate of return on invested capital in fabricating equipment based on 20-year depreciation. Example: Yearly saving for a $10,000 shear is estimated at $1400, yielding a 9 percent net return on the investment.

trode wire is fed after the arc is struck. The operator also straightens the shaft after welding. The rough part to be machined and welded is moved to his station on a roller conveyor, and the finished piece is returned to the same conveyor which carries it to subsequent operations. This may sound like mass production; actually it is not, for daily output runs only in the hundreds.

Combination of welding with other processing fits in nicely with the trend to "job enlargement" which many plants are promoting to take some of the boredom out of repetitive tasks, to enhance the skills of operator and, at the same time, to lower costs. In some instances, it works out that the single operator may be considered to be running a miniature plant, *Fig.* 1, even including the inspection of incoming materials or components and the finished parts which he has handled. Such an arrangement cannot help but give him far greater incentive and pride in his work.

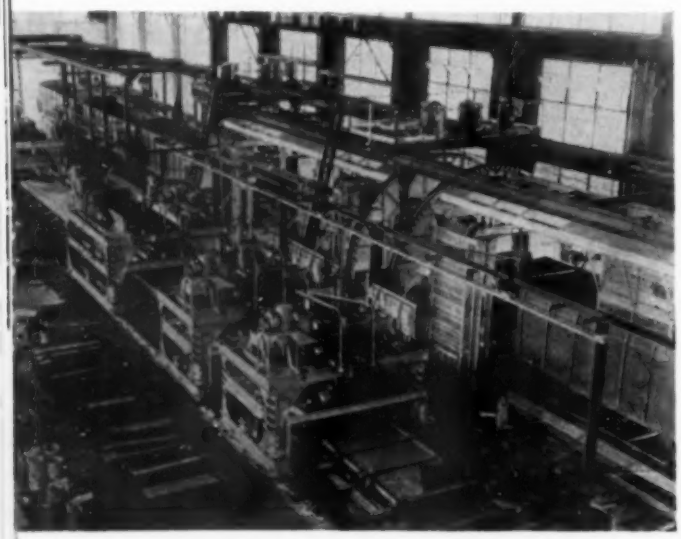


Fig. 4. Manual and automatic welding are combined in fabrication of railroad cars on an assembly line, the product moving down a line from one welding station to the next. Side sheets and other subassemblies are welded at stations along the left side of the line which is visible in the background.

What to Consider

Before reviewing some of the factors which must be considered in undertaking welding operations, it might be mentioned that it is usually advisable to place the responsibility for organizing a welding operation in the hands of a specialized welding engineer, or possibly the plant manager himself, depending upon the extent of production contemplated. Whoever is to take charge must cooperate closely with engineers and designers so that planning and production will complement each other. He will have to know and be responsible for the techniques of welding to be used, for the selection of the type of joints, for the welding equipment and training of operators, and for the choice of electrodes and the necessary tooling. Certainly he should also be conversant with welding metallurgy, selection of the proper metals, their weldability and the control of distortion.

Such an individual naturally will find it to his advantage to work closely with all suppliers of such essentials as welding generators, electrodes, welding machines and accessories, to realize the benefits of their broad experience in solving welding problems in all types of plants.

Materials and Design

While nearly all metals may be arc welded without too much difficulty, for the purpose of the present discussion it will be assumed that low-carbon steel—SAE 1030 or under—is the material being handled. Probably 75 percent of all production welding is on steel of this variety. Structural shapes, plates, sheet, strip and bars are the principal forms, ranging in thickness from several inches to 10 or 12 gage.

The low-carbon steels, such as SAE 1015, 1020 and 1025, have excellent weldability and impose few restrictions on the type of joint to be welded. They also permit a wide range in electrode analysis and sizes, as well as allow high currents and welding speeds, deep penetration and other favorable factors. Further, these steels command no premium price for chemical extras and are easily fabricated by conventional forming, shearing and machining processes.

All steels, however, are not as universally applicable. The advantages of special properties may be offset by extra welding costs. For example, high-sulphur free-machining steel might be selected to save machining costs. What is saved in machining, however, might be lost several times over in welding. This type of steel requires the application of special welding procedures.

Intimately related to the subject of materials is the design of the part itself. Since no specific items are being considered here, only a few basic points need be stressed. Designs should minimize to the utmost the amount of welding time required and should specify the minimum thickness of material to handle stress requirements. Extra beefing-up of welded joints is a waste of time and money. Thus, a V-butt weld in ¼-inch steel will average 20¢ per foot in cost, while the same weld in ⅜-inch stock will run at an average of about 45¢ per foot.

Proper location of welds designwise is also important. They should preferably be in neutral or low stress zones with the weld metal in tension. Accessibility naturally is desirable, especially to facilitate easy downhand welding which is always the preferred technique.

Design engineers should avoid "overwelding" in developing specifications. Practically all weldments incorporate at least one shape, such as a box section, that could be satisfied by a standard mill section, a bent shape or a welded seam. Which to select when appearance is not of paramount importance becomes either a guess or a tedious calculation. Variables, such as the number of pieces in the lot, stock thickness, length of the joint if welded, setup time, shearing time, bending time, etc., must be assessed and correlated in the final determination.

For a quick appraisal of the economics of welding vs. welding vs. forming vs. buying rolled sections, a series of charts has been compiled to show comparative costs and the break-even points with different quantities of a simple type of section. A representative chart, comparing welding versus bending costs, is shown in *Fig.* 6. Based on extensive analyses of the Lincoln Electric Company's own cost histories and time studies, the charts are, as stated, purely representative and should be modified or interpolated to fit the requirements of different conditions.

Problem: Should a design be specified to use two corners that can be either bent or made by welding three flat ¼-inch thick pieces together at the corners? The number of pieces in the lot is 15 and the joints, if welded, would require 5 inches of weld. (2½ inches of weld per corner).

Following the dotted example lines in *Fig.* 6,

Fig. 5. Integrating a welding operation into the production sequence often cuts costs and permits an operator to handle jobs other than the actual welding. Here a lathe operator automatically welds an extension on a shaft he has just machined. After welding he moves to the next station for straightening.

welding costs are less than those for bending when the legs of the bend are unequal, i.e., when the brake requires two gage settings. If the parts require only one gaging on the brake they would be less costly to bend.

These examples are close in the final results and actually, depending on local conditions, the method to use would be a matter of convenience. The guides are intended to keep the designer from making a costly mistake.

How Much Welding?

Fundamental to the establishment of a welding procedure, of course, is the amount of welding to be completed over a specified period of time. In other words, what are the lineal inches of feet of weld metal to be deposited per piece, how many inches or feet of joint must be welded and how many pieces per hour must be scheduled? Further, what is the operating factor—the floor-to-floor time per piece as related to the time required to lay down the desired inches of weld metal?

These questions are tied to the preceding comments on part design. In addition, it must be recognized that some parts will call for several passes to complete the joint; still others can be handled satisfactorily by "skip" welding, that is laying a few inches of bead, then skipping an equal distance and resuming the short weld. This saves both on electrode and power consumption and minimizes distortion after welding.

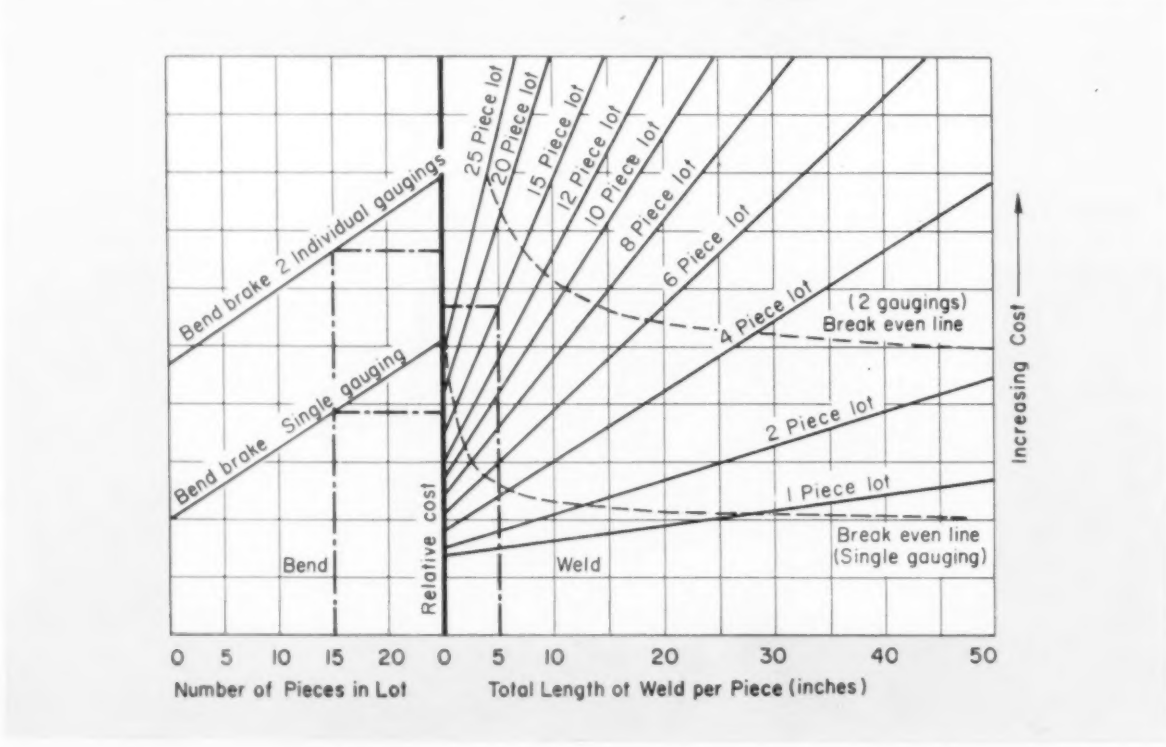
Position of the joint has a major effect on the speed and ease of welding. With the exception of sheet metal welding, welds should be made, as mentioned previously, in the downhand position, with the joint level wherever possible. A change from vertical or overhead to the downhand position can result in an increase in speed of as much as 400 percent for some joints. Downhand welding also simplifies manual operations and is mandatory for semiautomatic and automatic practice.

The subject of joint selection and design is an extensive one which is well covered in the welding handbooks. As indicated, joint design can affect costs and, therefore, the engineer should know why and how the various types of joints are used.

Succeeding articles in this series will discuss equipment and processes in Part 2 and tooling in Part 3.

Acknowledgments: The author acknowledges the helpful assistance of the Application Engineering Department of The Lincoln Electric Co. in supplying photographs and data for this article.

Fig. 6. Typical production chart giving comparative costs of welding or bending two corners, for $\frac{1}{4}$ to $\frac{3}{8}$-inch thick mild steel stock. Welding cost is based on standard procedure, using a 30 percent operating factor and adding time for welding setup, square shear set-up and shearing time for three pieces. Bending cost is based on time required to set up and shear one piece and set up and make two bends. Example traced is a 15-piece lot with 5 inches of weld. Welding is less expensive if the bent shape requires two gagings, but it is more costly if only one gaging is required.



How to Select and Use Die Steels

Abstracted from the section on "Selection and Characteristics of Die Steels," from the ASTE *Die Design Handbook*, this article presents some of the important considerations in choice of die materials. These are treated more fully in the book.

OVER 95 PERCENT of the metal-stamping operations found in industry today are performed with tools made of 26 types of steels. Of these, nine are widely applied and readily available. The other steels represent slight variations for improved performance in special applications. They may, in fact, enjoy exceptionally heavy usage for certain types of metal-stamping or forming operations. TABLE 1 lists the 26 steels by composition. The nine most commonly used are identified by the symbols W1, W2, O1, A2, D2, D4, M2, S1 and S5.

Letter and number symbols are commonly used to designate tool steels. The letter significance is shown in the following list. The number symbol is used to distinguish one grade or type from another in the same group.

W — water hardening
O — oil hardening, cold-work
A — air hardening, medium alloy
D — high carbon-high chromium, cold-work
S — shock resisting
H — chromium base, hot-work
T — tungsten base, high speed
M — molybdenum base, high speed
L — special purpose, low alloy
F — carbon tungsten, special purpose

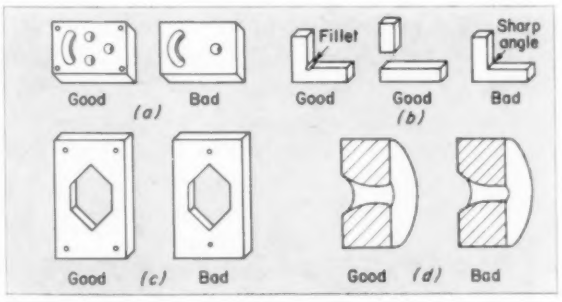


Fig. 1. When dies are designed, heat treatment must be considered. In *a* areas of mass are balanced by additional holes to dissipate heat from central area of die. Fillets or separate pieces, *b*, avoid sharp corners which cause warpage and soft spots. Holes should not be aligned with sharp angles, *c*; sharp corners should be avoided at bottom of die opening, *d*.

All steels in the list except those in the S and H groups can be heat treated to a hardness greater than R_c 62 and, accordingly, are hard, strong, wear-resistant materials. Some, such as T15, are capable of heat treatment to a hardness as high as R_c 67. Frequently hardness is proportional to wear resistance, but this is not always true because the wear resistance usually also increases as the alloy content, particularly the carbon content, increases. The toughness of the steels, on the other hand, is inversely proportional to the hardness and increases markedly as the alloy content or the carbon content is lowered.

A careful study of basic characteristics of the various tool steels will be of great assistance in making the selection of the proper grade. These are summarized in TABLE 2. For each job, a different characteristic may assume major importance, depending upon the material formed or worked and the requirements for economy, toughness, wear resistance or design, *Fig.* 1, which may affect the heat-treating characteristics or the need for machinability. The particular merits of each of the different groups are described in detail in the following paragraphs.

Water Hardening Tool Steels: Both W1 and W2 are readily available and of low cost. W2 contains vanadium and is more uniform in response to heat treatment and of a finer grain size with a higher toughness. Both are shallow hardening and, when hardened with a hard case and a softer internal core, these steels have high toughness. Water-hardening steels should be applied where dimensional change in hardening is unimportant.

Oil-Hardening Tool Steels: For many years O1 and O2 have been the workhorses of industry and often are known as manganese oil-hardening tool steel. Readily available and of low cost, these steels have less dimensional change than water-hardening steels and are of equal toughness when the water-hardening steels are hardened throughout. Steel O7, a tungsten oil-hardening type of greater

Table 1—Die Steels Commonly Used for Metal Stamping

Steel Types*	Average Composition (percent) C	Mn	Si	Cr	W	Mo	V	Other
W 1	1.00	—	—	—	—	—	—	—
W 2	1.00	—	—	—	—	—	0.20	—
O 1	0.90	1.00	—	0.50	0.50	—	—	—
O 2	0.90	1.60	—	—	—	—	—	—
O 7	1.20	—	—	0.75	1.75	0.25	—	—
A 2	1.00	—	—	5.00	—	1.00	—	—
A 4	1.00	2.00	—	1.00	—	1.00	—	—
A 5	1.00	3.00	—	1.00	—	1.00	—	—
A 6	0.70	2.00	—	1.00	—	1.00	—	—
D 2	1.50	—	—	12.00	—	1.00	—	—
D 3	2.25	—	—	12.00	—	—	—	—
D 4	2.25	—	—	12.00	—	1.00	—	—
D 6	2.25	—	1.00	12.00	1.00	—	—	—
S 1	0.50	—	—	1.50	2.50	—	—	—
S 2	0.50	—	1.00	—	—	0.50	—	—
S 4	0.50	0.80	2.00	—	—	—	—	—
S 5	0.50	0.80	2.00	—	—	0.50	—	—
H 11	0.35	—	—	5.00	—	1.50	—	—
H 12	0.35	—	—	5.00	1.50	1.50	0.50	—
T 1	0.70	—	—	4.00	18.00	—	1.00	—
T 15	1.50	—	—	5.00	12.00	—	5.00	5.00 Co
M 2	0.80	—	—	4.00	6.00	5.00	2.00	—
M 4	1.30	—	—	4.00	5.50	4.50	4.00	—
L 3	1.00	—	—	1.50	—	—	0.20	—
L 6	0.70	—	—	0.75	—	0.25	—	1.50 Ni
F 2	1.25	—	—	—	3.50	—	—	—

*Adapted from Report of SAE Iron and Steel Technical Comm., approved Jan. 1949 and revised Jan. 1952

wear resistance, because of higher carbon and tungsten content, is used for specialized applications.

Air-Hardening Die Steels: The principal air-hardening die steel is A2. This has a minimum dimensional change during hardening and higher toughness than oil hardening die steels, along with equal or greater wear resistance. Steels A4, A5 and A6 are newer developments of manganese air-hardening steels which can be hardened from lower temperatures but which have lower wear resistance.

High-Carbon High-Chromium Die Steels: Long-run dies are widely made from steels in this group. D2, containing 1.50 percent carbon, is of moderate toughness and intermediate wear resistance, whereas steels D3, D4 and D6, containing additional carbon, are of high wear resistance and somewhat lower toughness. Selection between these is based on the length of run desired, machining and grinding problems, and the necessity for controlling dimensional change during hardening. Steels D2 and D4, containing molybdenum, are air hardening and have minimum dimensional change.

Shock-Resisting Tool Steels: These contain less carbon and have higher toughness than the previously mentioned steels. They are employed where heavy cutting or forming operations are required and where breakage is a serious problem. Choice among the grades is a matter of experience. S5 is widely employed. This grade is an oil-hardening type of silico-manganese steel and is more economical than S1, which has equivalent toughness properties with greater wear resistance.

Hot-Work Die Steels: These are included because of their high toughness and air-hardening ability. They are occasionally used for cold-working operations. They are sometimes employed as holders for inserted dies where their high strength and little dimensional change, when heat treated to an intermediate hardness level, make them effective materials. However, a less expensive alloy will serve in most cases.

Tungsten and Molybdenum High-Speed Steels: Steels T1 and M2 are equivalent in performance, representing standard high-speed steels which have excellent properties for cold-working dies. They have higher toughness than many of the other die steels, combined with excellent wear resistance. They are more expensive than other steels in the list. They may be hardened in conventional manner or carburize-hardened, in which case they are more wear resistant than the high-carbon high-chromium steels. Carburizing is limited by difficulty in controlling warpage, size changes or soft spots. The same applies to T15 and M4.

T15 is the most wear-resistant of all steels in the list and M4 is slightly greater in wear resistance than a steel such as D4. Because these steels are difficult to machine and grind their use is limited.

Low-Alloy Tool Steels: Of the many steels in this group, L3, a chromium-vanadium steel, stands

Table 2—Comparison of Basic Characteristics of Steels Used for Press Tools

Steel No.	Non Deforming Properties	Safety in Hardening	Toughness	Heat Softening	Wear Resistance	Machinability
W 1	Poor	Fair	Good	Poor	Fair	Best
W 2	Poor	Fair	Good	Poor	Fair	Best
O 1	Good	Good	Fair	Poor	Fair	Good
O 2	Good	Good	Fair	Poor	Fair	Good
O 7	Good	Good	Fair	Poor	Fair	Good
A 2	Best	Best	Fair	Fair	Good	Fair
A 4	Best	Best	Fair	Poor to Fair	Fair to Good	Fair to Poor
A 5	Best	Best	Fair	Poor to Fair	Fair to Good	Fair to Poor
A 6	Best	Best	Fair	Poor to Fair	Fair to Good	Fair to Poor
D 2	Best	Best	Fair to Poor	Fair	Very Good	Poor
D 3	Good	Good	Poor	Fair	Best	Poor
D 4	Best	Best	Poor	Fair	Best	Poor
D 6	Good	Good	Poor	Fair	Best	Poor
S 1	Fair	Good	Very Good	Fair	Fair	Fair
S 2	Poor	Fair	Best	Fair	Fair	Fair
S 4	Poor	Fair	Best	Fair	Fair	Fair
S 5	Fair	Good	Best	Fair	Fair	Fair
H 11	Best	Best	Best	Good	Fair	Fair
H 12	Best	Best	Best	Good	Fair	Fair
T 1	Good	Good	Fair	Very Good	Good	Fair
T 15	Good	Fair	Poor	Best	Best	Poor
M 2	Good	Fair	Fair	Very Good	Very Good	Fair
M 4	Good	Fair	Fair	Very Good	Best	Fair
L 3-W	Poor	Poor	——	——	——	——
L 3-O	Fair	Fair	Fair	Poor	Fair	Good
F 2	Poor	Poor	Poor	Fair	Very Good	Fair

out as an effective die material. In large sizes it is water-quenched, giving it a hard case and soft core with attendant high over-all toughness. In small sizes it may be oil-quenched. L6 is a nickel-chromium-molybdenum die steel with oil-hardening properties. It is frequently used for auxiliary parts as an adjunct to dies and tools. It has less wear resistance and slightly higher toughness than the popular oil-hardening die steel O1. It is of limited availability but of reasonable cost.

Finishing Steels: F2 is occasionally applied where extremely high wear resistance in a water-hardening, shallow-hardening steel is desired. It is moderate to high in cost and difficult to grind after heat treatment.

Die Design for Successful Heat Treatment

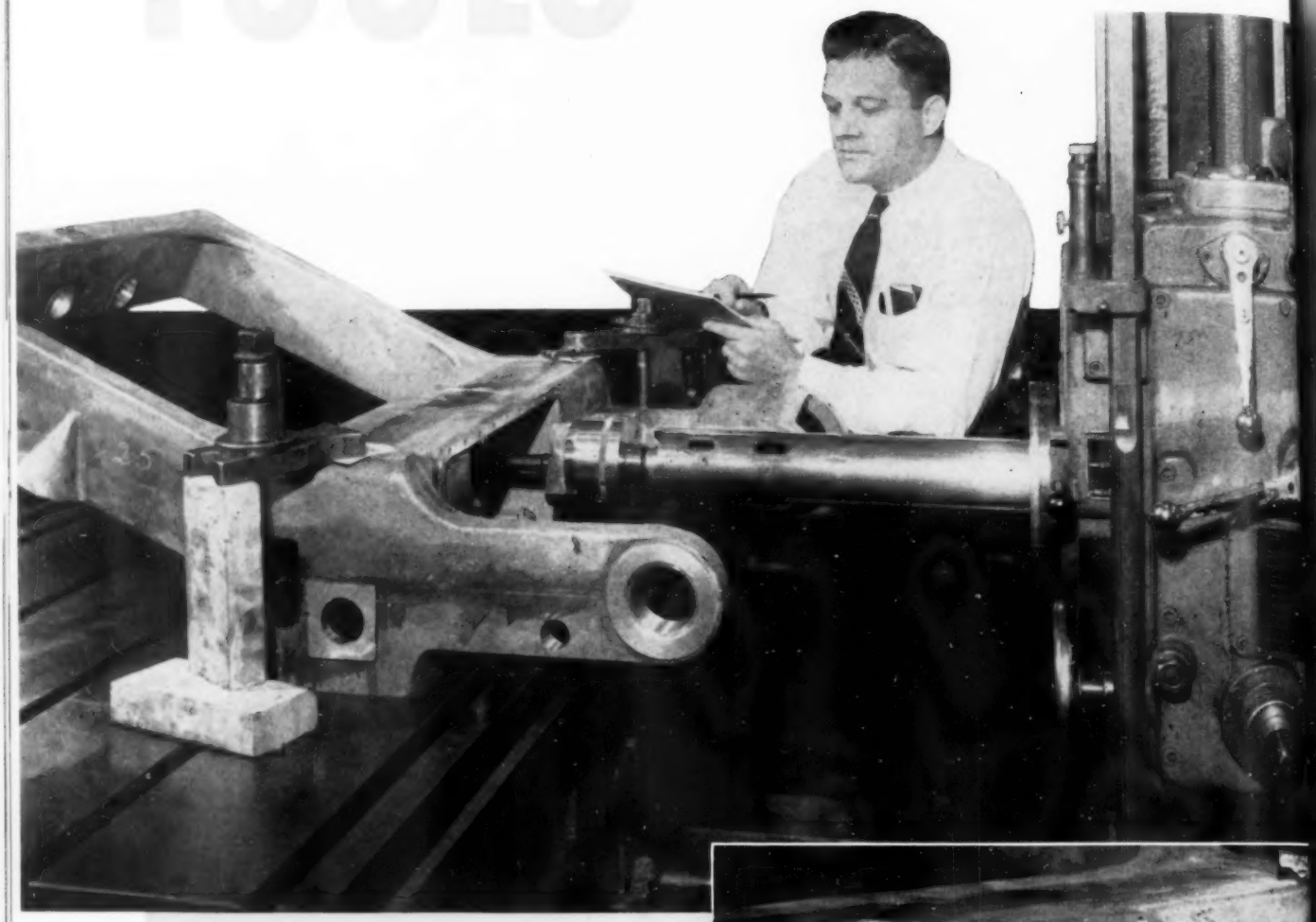
In the heat treating of die steels, greatest strain occurs during the quenching period. These strains are developed by the difference in cooling rates between various sections of a piece. Hence careful design will materially help to reduce quenching strains.

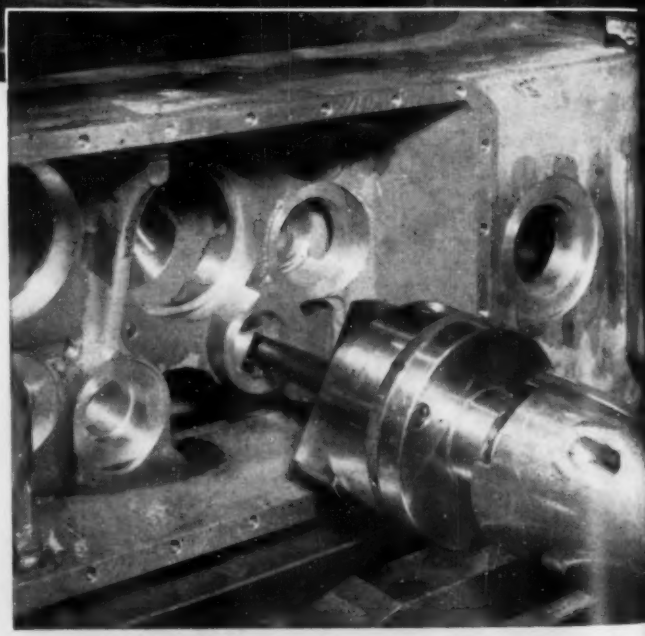
To prevent soft spots, distortion or breakage of costly dies the following rules are offered as indicative of good practice: Stock should be ordered large enough to allow for machining to remove decarburized surfaces. Screw holes should not be drilled closer than $\frac{1}{4}$ inch from edges of die blocks where possible. Blind holes should be avoided. All tools should be designed with round corners and fillets wherever possible, *Fig.* 1 *b.* Extra holes should be added, if possible, on heavy unbalanced sections to allow for faster and more uniform cooling when quenched, *Fig.* 1 *a.* Peening on dies should be avoided. On long delicate parallels, shafts, etc., pieces should be roughed out and annealed to remove strains before finish machining. Special considerations should be given, depending on whether the die can or must be ground after hardening. Screw holes in direct line with sharp angles of blanking sections such as *Fig.* 1 *c*, are likely to cause a crack. The remedy is to offset them. Sharp corners at the bottom of drawing or piercing die openings should be avoided, *Fig.* 1 *d.*

On unbalanced and intricately shaped dies air-hardening or high-chrome high-carbon tool steel (oil and air-hardening) should be used. Dies requiring little or no grinding can be made from various types of steels. High-carbon high-chromium tool steel can be used and heat treated for zero size change. An air-hardening tool steel such as 5 percent Cr type can be used, allowing for expansion in hardening. Based on previous experience with tools of the same size and shape, oil or water-quenching steels may be used.

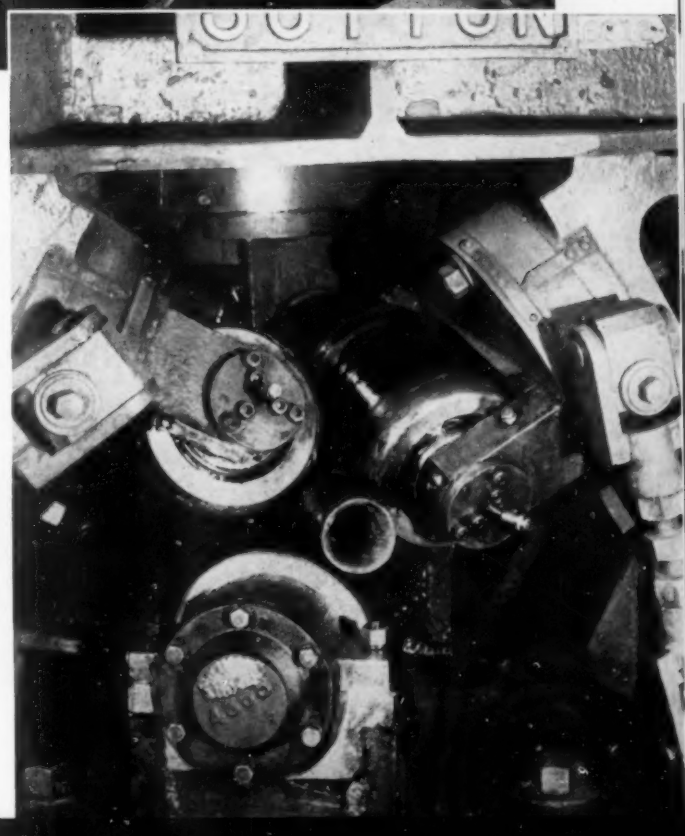
When dies must be ground to remove scale or skin air-hardening steels such as A2 are recommended. Or, oil-hardening steels can be used in sections which will harden through. A grinding allowance of 0.0015 inch per inch for manganese steels and 0.002 inch per inch for other oil-hardening steels is recommended. For water-hardening steels or oil-hardening steels in sections which do not harden through, distortion allowance can be accurately made only from previous experience with tools of the same size and shape. High-carbon high-chromium steels may also be used where the required tool life and wear resistance can be obtained only with them.

TOOLS at work





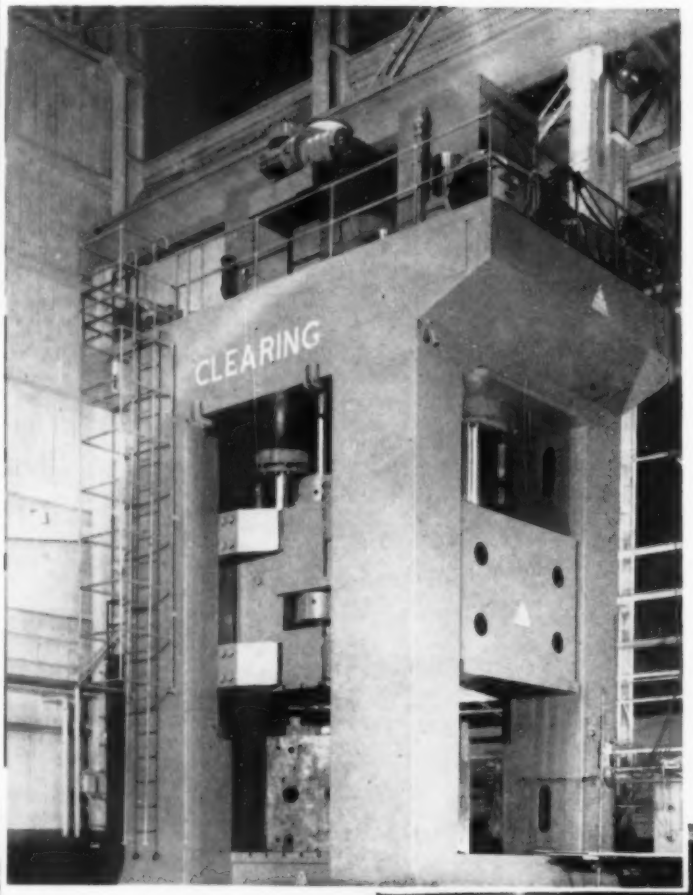
CLOSE TOLERANCE BORING of large aluminum casting for a radar unit is accomplished at Sterling Engine Co., Buffalo, N. Y. by special offset boring head. Operation is performed on a G&L horizontal boring mill in an airconditioned room. To maintain the tolerance of plus 0.0002 inch frequent adjustments of 0.0001 inch have to be made in the tool. This is accomplished in the Deka-Bore tool (close-up) by the conventional micrometer screw that activates the dovetail slide in thousandth increments, and a dial adjustment calibrated in 0.0001-inch increments over a span of 0.003 inch.



STRAIGHTENING hot rolled seamless tubing is performed at 300 sfpm in 7-roll straightener at Wooster, Ohio plant of Timken Roller Bearing Co. Heavy-wall alloy steel tube is entering the machine. Close-up shows entry end cluster with driven roll opposed by two idler rolls. An identical cluster at the delivery end and an unopposed pressure roll at the center of the pass complete the arrangement. Operator controls both table and main drive motor from one location. Production is increased from 20 to 50 times over press straightening.

—Photo courtesy Sutton Engineering Co.

TOOLS at work



TRIMMING massive aluminum forgings requires a press in which continuous pressure can be exerted over an unusually long stroke. Because of the wide variation in parts quick and easy adjustment of the stroke length is also needed. Shown in test operation, this hydraulic press satisfies design needs by means of a special cushion cylinder which takes up break-through shock. When the slide presses through the work the cushion restrains it and reduces pressure setting by exhausting through a fixed orifice. (close-up) The pulpit control panel gives the operator instant supervision of the 2000-ton press.

—Photo courtesy Clearing Machine Corp.

Unions for Engineers?

By M. L. Begeman*
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This article is published to present interesting ideas on a controversial but vital subject. Each engineer should come to a decision on this question before an answer becomes a necessity. Comments on this article and on the general subject are invited.

SINCE the turn of the century there has been a tremendous growth in union membership in industry and the building trades. Not until recent years has there been much attempt to organize professional groups. First efforts in this area dealt primarily with technicians, draftsmen, chemists and various semiprofessional groups. However, with many industries now employing large numbers of engineers, some form of organization seems advisable to many. They want such organization because, in a large company, there is a definite lack of personal contact between engineers and administrative officers, and engineers' salaries are thought to be inadequate. In order to resolve these conditions and to promote their general welfare, some engineers have turned to union organization. They hope that such organization will do for them what has already been accomplished for subprofessional groups.

Up to the present time, unions of engineers have not had sufficient experience to demonstrate either success or failure. Some experiences have brought to light unforeseen objections that tend to overbalance the hoped-for gains. Engineers are individuals with professional training and do not thrive under regimentation. They engage in various kinds of activities and their work cannot be standardized. Unionism has a definite leveling effect upon its membership and tends to destroy initiative —a vital quality in a successful engineer. It does not encourage application of new ideas by its members, which is so necessary for personal development.

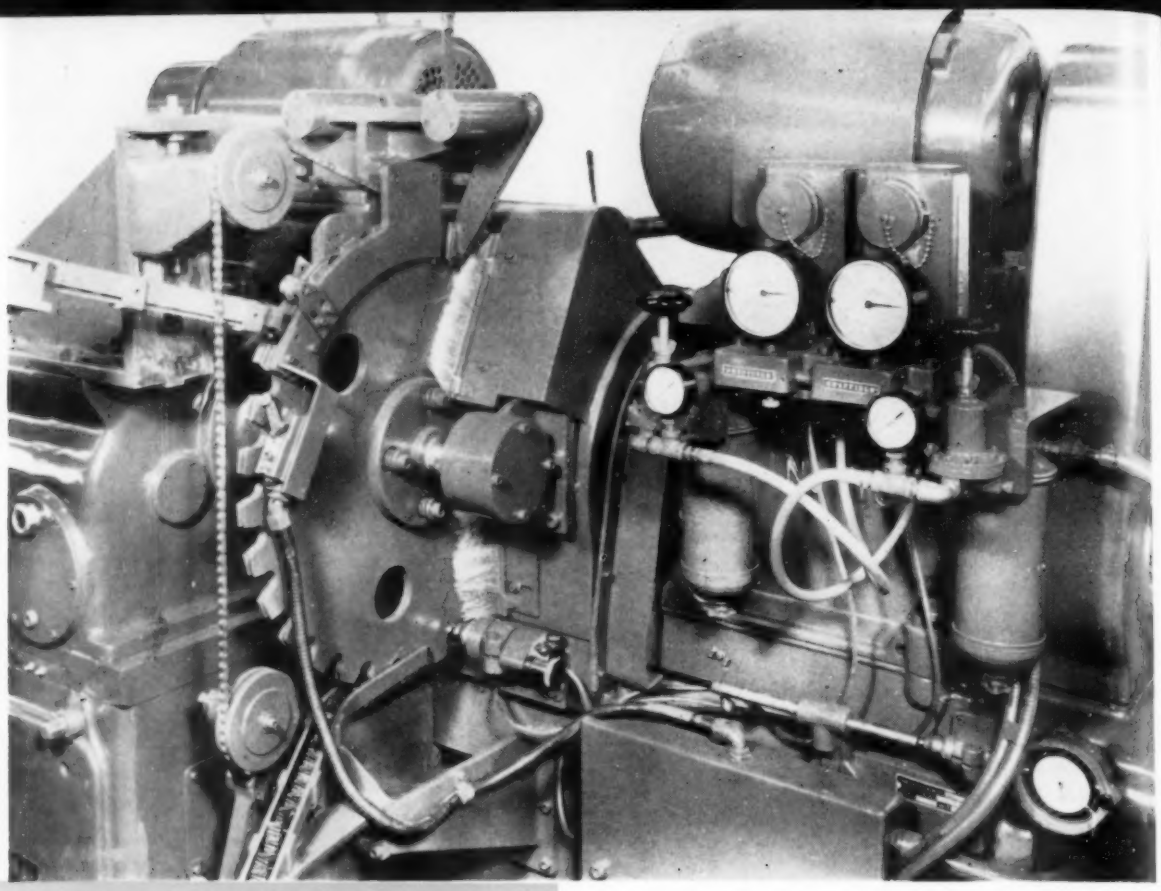
Past industrial experience with large groups has invariably demonstrated that the work level is low, the incentive to work is decreased and initiative is stifled. To most engineers, such conditions are distasteful and it is doubtful if many would continue satisfied under such conditions. Also, there is always the threat that an engineers' union in a large organization might come under some domination by subprofessional groups. As a matter of fact, it is quite possible that present labor organizations may force engineers into such unions if engineers do not take action to solve their own problems.

It appears that one of the best remedies for the engineer in his present predicament is to improve his public relations. Few people know about the accomplishments of engineers and little publicity is given to those who have attained distinction in their fields. Engineering professional societies, associations and local groups should institute programs in public relations. If this does not appear feasible, because these societies are principally concerned with professional matters, then a single unified engineering group should be established as is done in most other professional fields. Present engineering societies would then be subordinate to the over-all organization which would be of sufficient size and strength to exert national influence.

This organization, with its many member societies, should publicize the profession, its members and their accomplishments in every possible way. Such publicity should be directed to all media of communication. The program must include work at all levels: local, state and national. Much can be done at the local level since that is the place where opinions originate. Engineers should develop an interest in local civic affairs and become identified with other professional groups. Registration of all qualified engineers should be encouraged and efforts made to eliminate the misuse of the word "engineer."

An effective program of public relations will not only raise the standing of the profession but will also instill in each engineer a feeling of responsibility and pride. When professional standing is recognized, there will be little demand for an engineering union, no matter what the size of the employer. His salary will be in line with his abilities and his contribution to the enterprise. He will have the necessary personal contact with the administration. It has often been said that "a union cannot give a man anything that a company cannot give him." If this fact becomes recognized by industry, the need for an engineers' union will no longer exist.

*Senior member ASTE Houston chapter.



Automation of end grinding operation incorporates pneumatic gaging in the machine control. Parts are fed automatically into the part carrier and clamped by a chain so they can be gaged from each ground face to the theoretical centerline of the carrier. This provides the means of actuating wheel slide compensating mechanisms.

Setting Goals in Automation

By W. Fay Aller
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DEVELOPMENT of an automation line requires extensive planning and detailed study in order to devise and build a system that will function economically, consistently and accurately. The raw stock must be made to flow from operation to operation more smoothly and consistently than can be accomplished by human hands. Also, gaging, controlling and qualifying must be accomplished effectively. These are the goals of the automation engineer.

There are many different concepts of automation, some of which are embodied in the accompanying applications. To the machine tool builder, automation consists of standard or semistandard machine tools with automatic chucking surrounded by conveyors to handle the material plus machine controls and gages. To the conveyor manufacturer, it is merely a rearrangement of present machine tools and gages to which his almost human handling equipment has been added.

To me, automation is automatic machine controls and automatic gaging, receiving an assist from ma-

Abstracted from paper 23T7, "Setting Goals in Automation," presented at the 23rd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

chine tools and conveyors. To you, automation is a means of manufacturing economically by using the best in machine tools, handling equipment, and gaging and machine controls—united to give a constant flow of suitable quality products with a minimum of man power.

Unfortunately, in the early stages of automation, some of the dreamers suggested that it must follow the line of mechanically simulated hands and electronic brains. This theory, in my opinion, is as foolish as a man's early attempts to fly, when he tried to reproduce faithfully the form and movement of the wings of birds. While it is difficult to lay down rigid rules for guidance, it is safe to make a general statement: present-day automation must be simple, easily serviced and dependable.

This is exemplified in one of the earliest forms of automation—the automatic screw machine. Bars of metal are fed in and finished parts are dropped out. Numerous operations are performed without operator help. The dependability and infrequent tool failure of the modern multispindle automatic screw machine are responsible for its survival, because otherwise the failure of one tool or part causes the shutdown of the equivalent of six machines. Since automation ties many machines together, unless sufficient banks are placed between them, failure of any one machine shuts down the whole line. Down time is extremely costly. Visualize the shutdown of a modern continuous strip steel mill. Failure of any part to function idles millions of dollars invested in equipment. On top of this is the cost of lost production.

Those interested in automation could well take a look at some of the extremely rapid methods for replacement of major parts, such as rolls in a steel mill and apply some of the same philosophy in their automation engineering. In the gaging phase of automation, my preference is pneumatic and straight electric sequenced operations for simplicity of maintenance and dependability. All units should be mounted in the open so that the maintenance man can observe and, if necessary, replace units without tearing down the complete machine.

Automation, just like any production setup, will vary considerably from plant to plant and product to product, due to quality and quantity desired. Certainly the same prescription cannot be written for a product that will be produced by the millions without change for years as that for a product subject to frequent change and low quantity manufacture. Again, the economics of the particular problem must dictate the degree to which automation is applied.

The accompanying illustrations give a bird's-eye view of what modern automated processes are like. These are actual operations in use in various plants today. The advantages of automation to the manufacturer include:

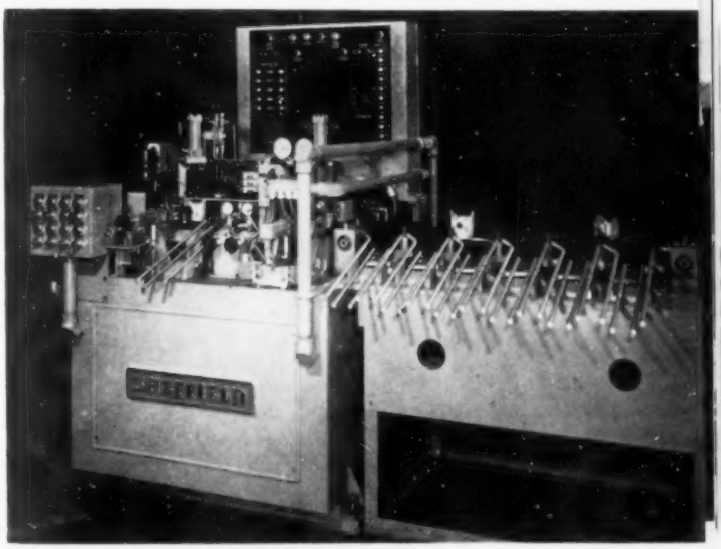
1. Reduction in floor space. On assembly and final inspection operations alone, in certain instances the reduction for a single line might be from 25,000 feet to less than 100 square feet of floor space. In many cases the necessary equipment may be completely paid for by the reduction in floor space alone. The small area also allows much better surveillance and greatly reduced handling. In the machining, heat treating, and grinding operations, a reduction may also be made although in lower proportions than in assembly.

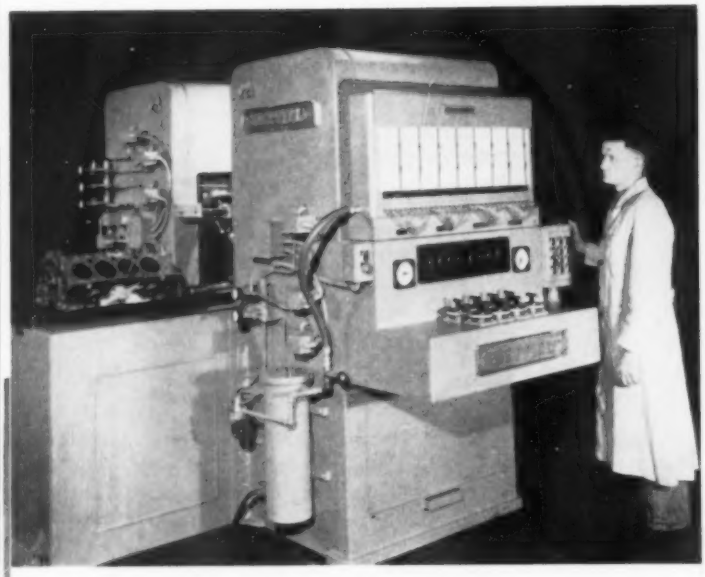
2. Reduction in direct labor. One operator may efficiently operate 15 or even 20 machines. As parts are automatically checked at machines, floor inspectors may be eliminated. As the parts automatically flow from raw stock through machining, heat treating, grinding, washing, assembly, inspection and packing, a great reduction, if not complete elimination of toting and trucking may be effected.

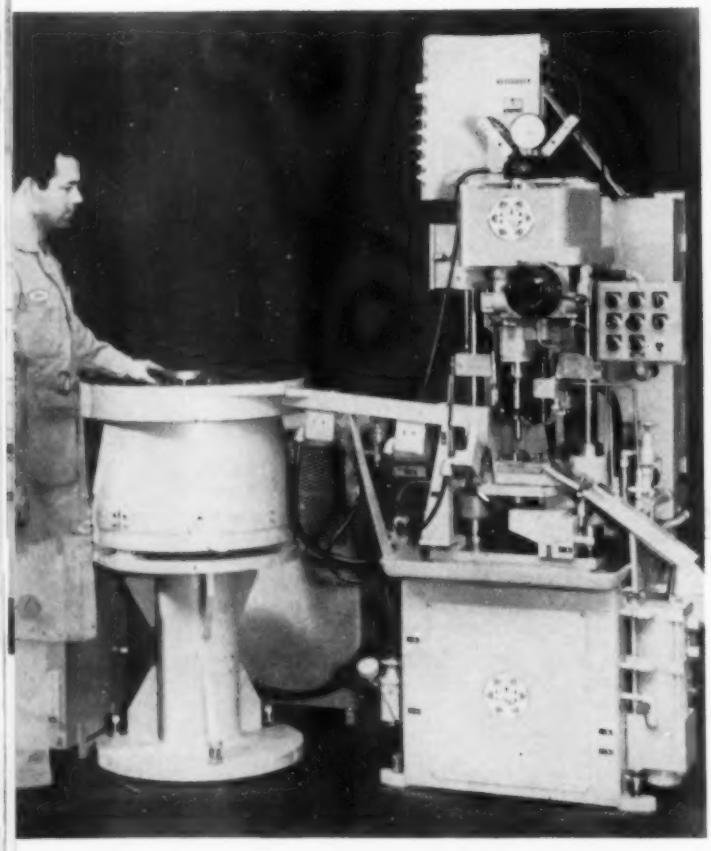
3. Impressive scrap reduction and quality improvement. Since the gaging takes place at, or immediately after each stock removal process and feedback is made to the machine, the scrapping of one or two parts is sufficient to shut down the offending machine and cause the operator to adjust it for correct process. An immediate scrap reduction of from 5 to 0.5 percent is normal. In a line producing 1,000 small parts per hour, this may amount to the equivalent of 45 pieces each hour the line is run.

4. Infallibility of assembly. Inasmuch as the parts delivered to assembly are correct and the matching of the parts is not subject to human errors in the choice of parts assembled, few rejections are made in the final inspection. There have been times when rejections, teardowns and reoperations have caused production costs to double.

Inspection stations grade and sort pistons in automated parts manufacture. The pistons are classified and stamped for pinhole sizes in five increments of 0.0001 inch; next for diameter and taper of skirt in 10 increments of 0.00025 inch, finally being segregated for transfer according to skirt classifications. Out-of-tolerance parts are ejected separately.







(lower left) Pneumatic part transfer slide positions parts received from hopper feed for honing operation. Automatic gaging is performed as part leaves hone (right). If part tolerance is approached a warning signal is given and if rejects are produced they are ejected from the line. The machine shuts down if a predetermined number of bad parts are produced.

(top left) Engine block automation line incorporates pneumatic gaging to check diameter, roundness and taper of cylinder bores. The block is pneumatically transferred into position and positively located by shot pins in dowel holes of the pan rail. Bore size classifications indicated are set on dials by operator to automatically stamp them on the block when inspection is complete.

(above) Connecting rods are automatically gaged for parallelism of piston pinhole with respect to the crank pinhole. If beyond tolerance, the rod is rejected in passing to the following station. At the second station the crankpin hole is gaged in two planes and the pinhole is gaged for size. Rods are automatically segregated into four grades of 0.0001-inch increment.

5. Reduced process time from raw stock to shipped product. The dream of the factory manager is realized when this time is reduced from 33 working days to less than 24 hours. This allows him to service customers more quickly and profitably because the investment in the work in process is reduced. It also means that the parts are in process such a short time that damage and poor quality resulting from corrosion and rust are eliminated. This is further improved by mechanical, rather than human handling.

These five advantages certainly add up to greatly improved quality, economy and efficiency . . . . and money in the bank.

The principles outlined could be used for cartridges, shells, fuses, airplane or tank parts, or whatever the product may be. The only requirement is that sufficient quantity must be produced to justify automatic treatment or one somewhat modified The yardstick of economy must be applied in each case.

The fundamental methods of creating automation are many. Manufacturers in some cases, having sufficient talent at hand, develop the complete line by using standard units of both machine tools and gages obtainable from other manufacturers. This method is commendable inasmuch as one group of engineers is responsible for the complete line. In some cases, the line is established by drawing in several companies, each of which is reputable in

particular field of equipment and asking them work together. This is a rather perilous venture it is almost impossible to properly place responsibility with several firms involved. It is much safer buy equipment, gages and controls in properly tailored assemblies, rather than by bits and pieces and then try to assemble them as a jig-saw puzzle. The company with experience and manufacturing knowledge in a number of products can frequently find short cuts and improvements that are missed by the engineers working with their product alone.

In many cases, a machine tool builder will cooperate with the gage builder to produce equipment that is controlled from a common panel. He may allow complete stations for the insertion of automatic gages by the gage maker. This method has much merit as it allows the machine tool builder to do what he knows best and the gage builder to do what he knows best.

What does all this mean to management? First and foremost, that there is a comparatively new method of manufacturing which cannot be taken for granted. It means that alert executives must explore every possibility in this new concept for a more economical approach to manufacturing problems. If, upon investigation, it appears that certain products can be manufactured more economically by this method, an executive must compile figures showing how much can be saved in floor space, personnel, improved quality, scrap reduction and capital investment.

Each problem must be considered on its own merits and be properly justified economically. Upon justification, management must determine what method to pursue to obtain this automation. This fulfillment can undoubtedly add new headaches. Some new problems will arise between labor and management. A reduction in lower skills will be accompanied by an increase in higher skills. This will require considerable educational work and employee upgrading.

A question frequently asked is, "In the installing of automation, don't you feel guilty throwing so many people out of work?" Automation does not throw people out of work. It could conceivably, temporarily dislocate some, however. Fortunately, automation cannot possibly take place overnight, even if every product deserved that dream. The transition to automation is so gradual that the normal loss of personnel when not replaced, makes the laying off of employees unnecessary.

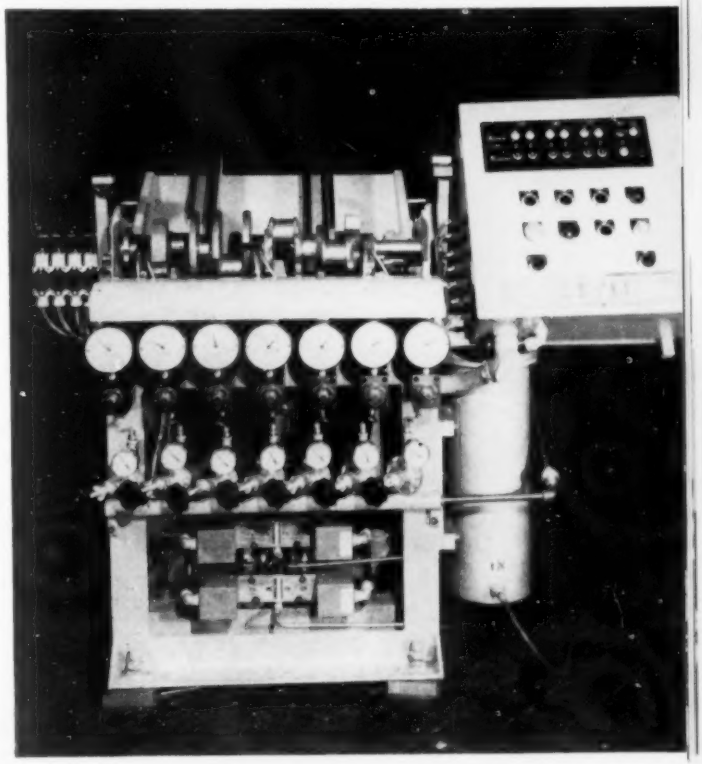
At the same time, the intelligent use of automation will eventually expand the use of the product, so that even more people are required to produce the needs. The lowering of the product cost puts it in reach of more people and, instead of creating unemployment, results in a higher standard of living for everyone. It will be necessary, however, to train and upgrade personnel to the skills required to build, service and operate the more complicated equipment.

By way of illustration, the first textile machinery invented in 1768 was destroyed by angry laborers. History has shown that this equipment, when perfected, made textiles available to all at prices they could afford to pay and multiplied many times the number of people gainfully employed in the industry. In another instance the president of a large company, some 20 years ago, was placed in responsible charge of a company employing 300 people. He determined to eliminate every possible employee by the addition of the best possible equipment. Today, that company employs 30,000.

The automobile is another product in that category. At its beginning, everyone thought "This will put the poor horse out of work. It will put people out of work, making carriages, buggy whips, and other items too numerous to mention." It did! But look at the automobile industry today.

The transition from machine shops to automation is no different in principle than the change from hand tools to power tools. It is just another step in removing drudgery and allowing more people to enjoy the fine things of life.

Automatic crankshaft gaging station where the center and two end main bearings and width of thrust bearing are automatically gaged. If a dimension is beyond tolerance the line is stopped. The operator can locate the defective dimension from the indicating panel and then read the exact dimension from the respective dial.



fast quench

reduces heat treat distortion

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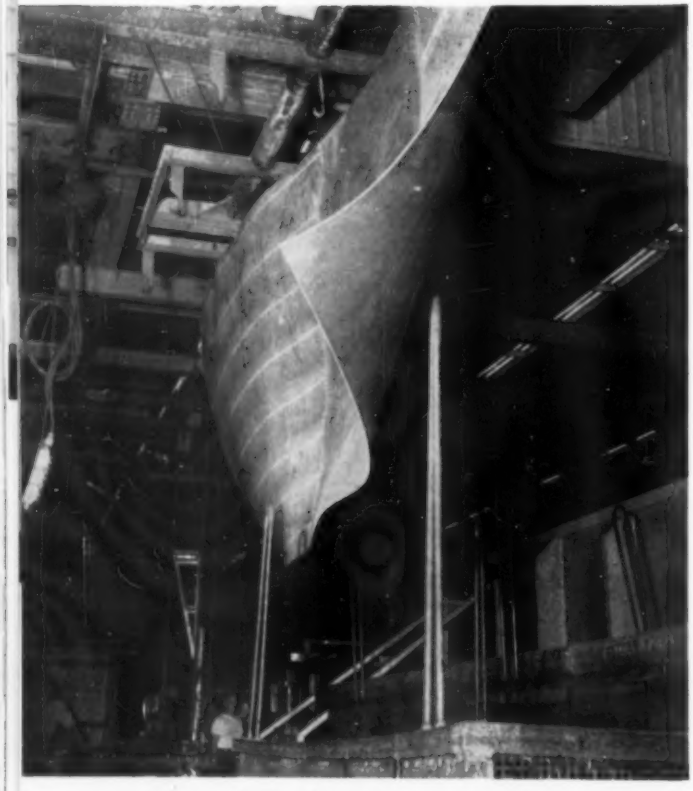


Fig. 1. Badly distorted from the effects of conventional dip quenching, tapered sheets of 7075 aluminum presented formidable production problem because forming had to be completed within 30 minutes after quenching.

DISTORTION, warpage and ripples caused by quenching hot aluminum alloy sheet, *Fig.* 1, have been troublesome and costly problems for aluminum producers and fabricators for many years. Spray or fog quenching techniques have been developed to reduce distortion but the resulting heat-treated item exhibits characteristics that restrict its use. Corrosion resisance is considerably reduced and the highest physical properties are generally not attained with fog or spray quenching. Corrective measures throughout the industry have generally been directed at the development of efficient means to straighten warped material and remove distortion rather than toward finding a quenching technique that reduced warping while producing optimum properties.

Stretch and roll straightening have been in general use for some time and where applicable achieve relatively good rates of production. Quenched sheet is straightened immediately after quenching because after a relatively short time at room temperature the metal will age and become more difficult to straighten. When straightening must be delayed for more than an hour, the metal is placed under refrigeration to prevent age hardening.

Faced with a serious production problem that did not lend itself to solution by conventional methods, McDonnell Aircraft Corp. was forced to try a new approach. A major part of the wing of a Navy fighter consisted of 6 by 18-foot sheets of aluminum alloy 7075. Sheets were purchased in the -T6 temper and then taper milled from the middle to the ends. The tapered sheet was then to be stretch formed to a crowned saddle shape.

Forming required optimum formability in the alloy so it was necessary to heat treat the tapered

Abstracted from paper 23T16, "Aluminum Heat Treatment," presented at the 23rd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

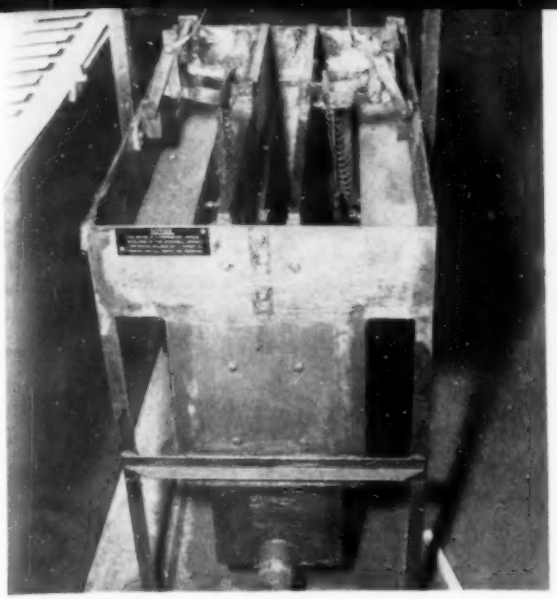


Fig. 2. Experimental model of the slat quench tank. It comprises a dry well separated from wet wells on each side by slatted walls.

sheet and form it immediately after quenching. It was here that McDonnell discovered a series of problems that stemmed from warpage that occurred during quenching and which was complicated by the specific characteristics of the forming operation.

Most stretch forming is done by stretching the sheet longitudinally and ripples or buckles that tend to appear on the long edges are usually removed during the forming operation. The sheet McDonnell was handling was tapered longitudinally and so could not be stretched lengthwise because of the varying thickness of metal. Forming required for the final configuration made it necessary to grip the long edges of the sheet and stretch it transversely.

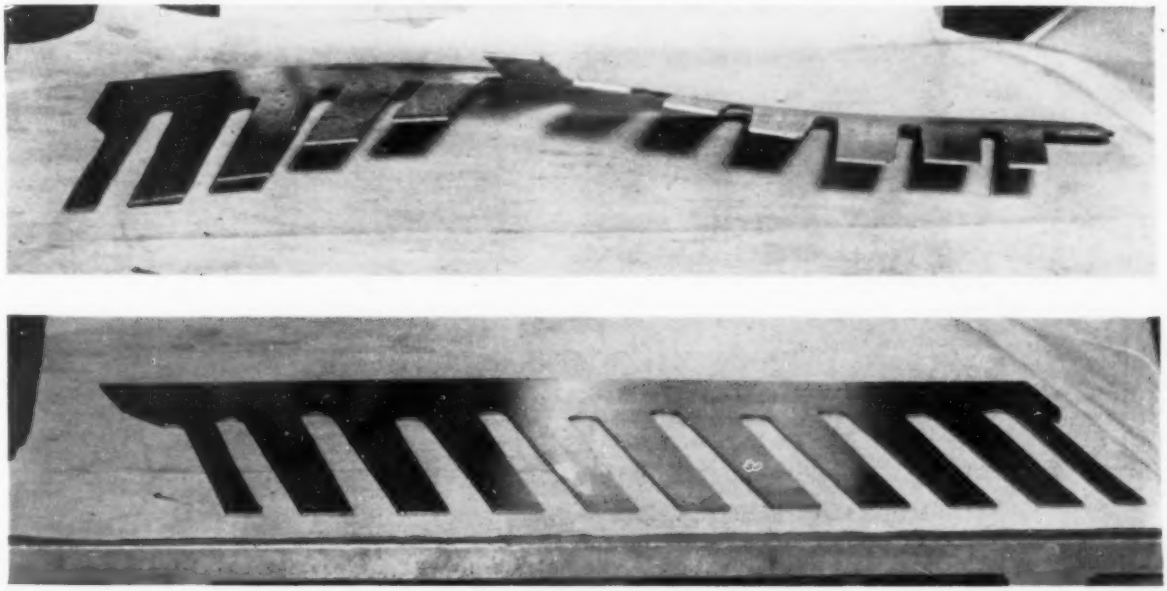
Time from quench to completion of forming was critical and the quench-induced ripples along the long edges made it almost impossible to position the material in the stretcher jaws. A separate straightening operation was impractical because of the time required. Pulling in a transverse direction did not remove the ripples even when it was possible to clamp the sheet in the stretcher jaws. The time spent in positioning the sheet in the stretch press was consistently running over the critical period and a number of sheets were destroyed. Operations were suspended and McDonnell's engineers sat down to study the problem.

First, they isolated the cause of the trouble by taking moving pictures of a conventional quenching operation with a high-speed movie camera. It was observed that as the hot metal from the salt bath entered the quench water, the quenched portion contracted immediately while the unquenched metal at near plastic temperature did not. The ripples and the wavy surface were generated immediately with the onset of quenching and continued throughout quenching. Waves that went across the sheet were not particularly difficult to deal with, but local ripples along the edges were a cause of real concern since they could not readily be removed and could not be accommodated in the stretcher jaws.

It became obvious that the problem was the unequal cooling rate during quenching; a fact that was not unknown to the aluminum industry but not fully appreciated either. Inasmuch as dip quenching was completed in about one second, it was also obvious that quenching had to be instantaneous at all parts of the sheet.

Quenching with two vertical walls of water that would contact both sides of the sheet at the same time appeared to be a logical solution to the basic

Fig. 3. Comb-section part of 4130 steel shows marked distortion after conventional quench, top. An identical section quenched in oil in the model slat quench tank of *Fig.* 2 shows no warpage, bottom.



problem. The design and construction of equipment to accomplish this was the next step. An experimental quench tank consisting of three compartments side by side was built, *Fig.* 2. The middle section was a dry well separated from the two outer sections by movable water-tight slats that could be opened simultaneously. The two outer sections were wet wells filled with water. The hot sheet of 7075 alloy was removed from the salt bath and quickly positioned in the dry well, midway between the two banks of slats. When the slat walls were tripped, the slats opened from top to bottom like venetian blinds and vertical walls of water deluged the hot sheet metal. Quenching was accomplished at all parts of the sheet at the same time.

Various thicknesses of 7075 sheet were quenched in the new slat quench tank and similar sheets were quenched in conventional dip tanks for comparison. As expected, conventional quenching produced marked distortion while the slat-quenched specimens were relatively flat and free of edge ripples, even in thicknesses as light as 0.020 inch.

Fortified with the knowledge that they were apparently on the right track, engineers decided to prepare a scale model of the tapered 6 by 18-foot section and quench it in the slat quench tank.

Before going ahead with the machining of the scale model, the problem of heat treating a "comb" section of 4340 steel came to the attention of the group working on the quench tank. Quenching the comb section had resulted in extreme distortion and, since the full section could be accommodated in the model slat tank, it was decided to try the new technique on the comb. The quenching medium was changed from water to oil and the comb section was heated and quenched.

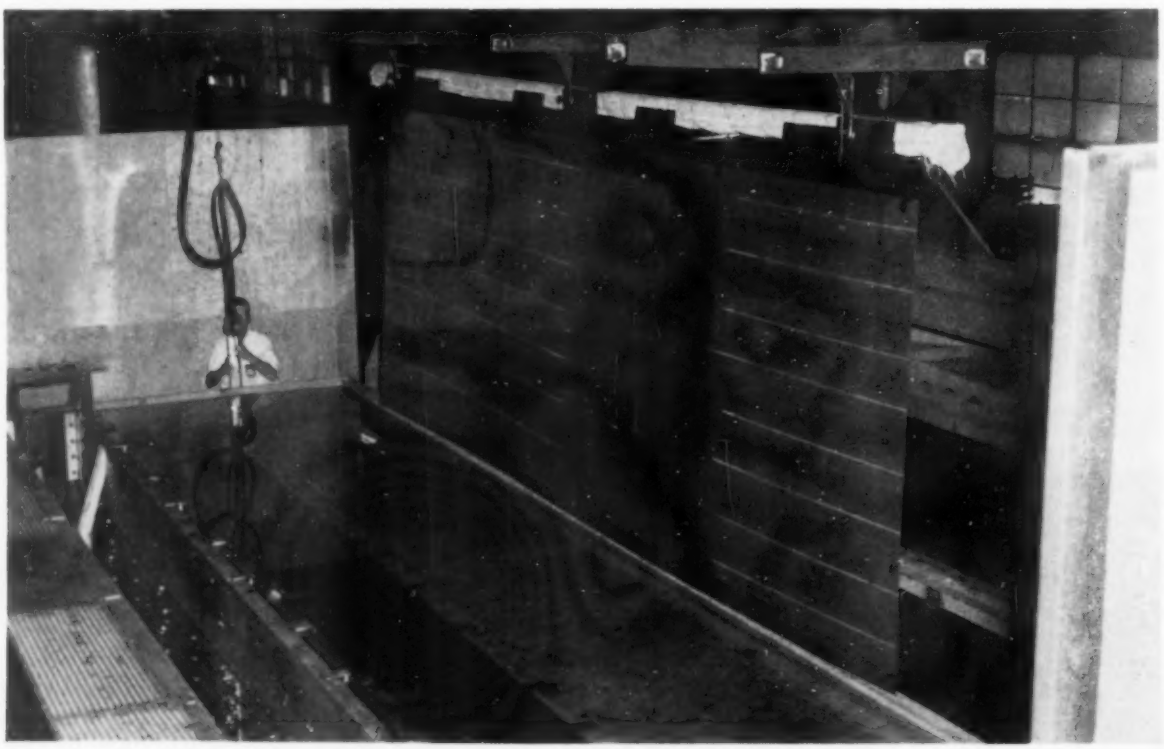
The resulting lack of distortion, *Fig.* 3, in this difficult alloy and shape convinced McDonnell officials that continued experimentation was unnecessary and construction was immediately started on a full-size slat quench tank, *Fig.* 4.

During experimental work preceding the start of full production runs of the full-size tank, a few sheets had to be discarded but with the development of improved operational techniques, the rejection rate dropped to practically zero. A rejection rate of 1 to 2 percent can be assigned to the operation, a low figure when compared to past experience in handling 7075 alloy.

Design refinements introduced in the full-size tank compensate for the differential in static pressure from top to bottom by decreasing the size of the effective aperture. A larger tank will simply slant the slat banks to accomplish the same result. Design of the slats also provides a means for creating turbulence in the quench water to allow the ready escape of steam generated by the quenching operation.

The slat quench technique, for which patents have been filed by McDonnell, is expected to have far-reaching significance in the aluminum industry as well as in all metalworking fields where a fast quench will solve problems of distortion of heat-treated parts.

Fig. 4. Tapered aluminum sheet, raised from the salt bath, approaches the dry well of the full-size slat quench tank.



selecting effective gear inspection methods

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UNIFORMITY is a universal aim in the production of gears. To control and assure uniformity is the purpose of gear inspection, *Fig.* 1. Service conditions for aircraft, automotive and machine tool indexing gears exemplify the problems involved. For all of these a high degree of uniformity must be maintained.

Even where gears do not have to meet extreme service requirements dynamic loads imposed upon gear teeth as a result of manufacturing errors can easily double the expected tooth loading. In fact, most gears could be reduced in size if they could be produced more accurately.

Some engineers think of gear inspection as a costly evil, to be applied to meet only the most accurate specifications. The real problem, however, is in finding the proper type and degree of inspection because correctly applied gear inspection actually reduces over-all costs by:

1. Assuring a definite degree of uniformity in keeping with specific service requirements
2. Permitting engineers to specify the most economical gear size and design
3. Reducing scrap and rejections.

Gear inspection today means control over an increasingly complicated manufacturing cycle. Hobbing depends upon blanks, shaving upon hobbing and final accuracy upon heat treatment in addition to other previous operations.

Determination of the most economical checking procedure is relatively complex. Factors include size of the manufacturing department, nature of its production runs, type of gear produced, and the skill and knowledge of its people. Fortunately, a wide variety of checking procedures is available.

Basically, there are two types of gear checking: functional and analytical. The first consists of testing gears by the way they roll or function. The second comprises the various methods of measuring dimensional characteristics such as involute, lead or spacing.

For most gears, the main criterion of quality is smooth rotation even when idling. Since that can be achieved only by relatively true-running gears with good involutes and spacings, test rolling is a practical and relatively simple means of checking. In most up-to-date gear departments gear rolling fixtures with master gears and indicators are placed directly alongside hobbing, shaping and shaving machines for a constant check of output. They are

Fig. 1. Operator setting up analytical comparator to check a helical gear with recording mechanism.

Abstracted from paper 23T8, "Planning for Effective Gear Inspection," presented at the 23rd ASTE Annual Meeting. Copies of the complete paper will be available from Society Headquarters.

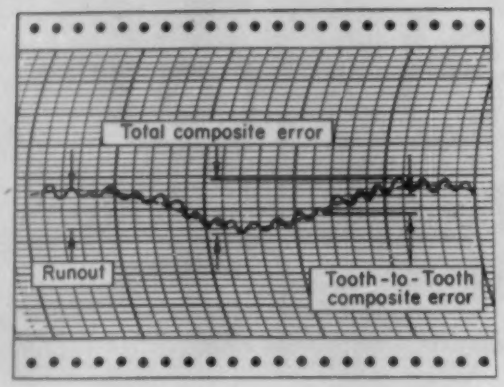


Fig. 2. Graphic record of tooth-to-tooth composite error.

Table 1—Runout—Total Indicator Reading Measured on Pitch Circle (x 10-4 inch)

Class and Operating Speed	Diametral Pitch	Pitch Diameter (inches)								
		¾	1½	3	6	12	25	50	100	200
Class 1 (up to 80 fpm)	½	—	—	—	—	—	100	100	140	180
	1	—	—	—	—	70	90	90	100	150
	2	—	—	—	60	60	80	80	90	120
	4	—	—	50	60	60	80	80	90	120
	8	—	30	50	60	60	80	80	—	—
	16	30	30	50	60	60	80	—	—	—
Class 2 (Up to 400 fpm)	1	—	—	—	—	30	35	40	45	60
	2	—	—	—	20	20	25	30	35	45
	4	—	—	20	20	20	25	30	35	40
	8	—	15	15	20	20	25	30	—	—
	16	15	15	15	20	20	25	30	—	—
Class 3 (Up to 2000 fpm)	2	—	—	—	20	20	25	25	30	35
	4	—	—	10	20	20	25	25	30	35
	8	—	10	10	15	20	25	25	30	35
	16	10	10	10	15	20	25	25	—	—
Class 4 (Over 2000 fpm)	2	—	—	—	10	10	12	14	16	—
	4	—	—	—	10	10	12	14	16	18
	8	—	—	10	10	10	12	14	16	18
	16	—	10	10	10	10	12	14	16	—

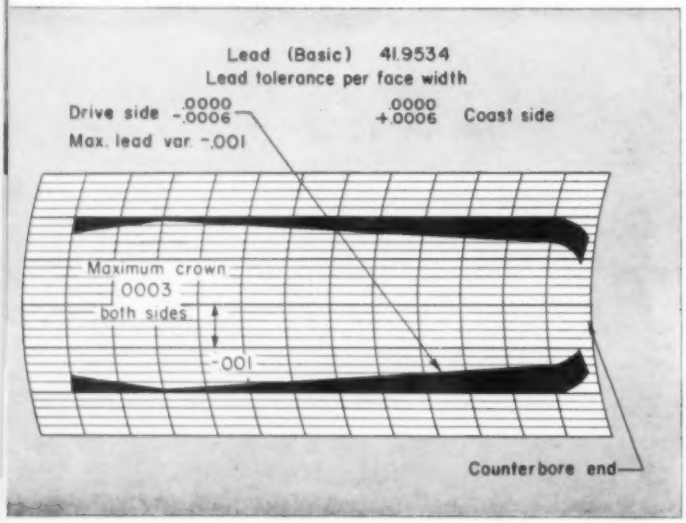
Adapted from AGMA St'd. 231.02

also found in final inspection departments. More elaborate universal machines, including recording, are an important part of every gear laboratory.

Functional gear checking is a true measurement of size and runout. While admittedly somewhat distorted, it gives an indicative picture of individual tooth errors. Gear rolling cannot reveal form errors on gears which are heavily modified for deflection under load, nor will it serve to check the intentional lead variations (crowning) which compensate for mismounting. In such instances, gear rolling is used solely to measure size and runout and to detect nicks or burrs.

Gear rolling is no more reliable than the master. Accuracy of the master gear is most important. Errors indicated in gear rolling are composite. If the check is recorded, a graph similar to *Fig.* 2 results. Individual tooth errors represent a composite of errors in from 2 to 4 gear flanks in simultaneous contact. These individual tooth errors in turn are arranged on a coarser wave pattern which represents the runout or more generally the out-of-roundness of a gear. The so-called "total composite error"—which is usually looked for in gear rolling—is therefore again a combination of runout and composite tooth-to-tooth errors. Usually the runout error is much larger than the individual tooth errors. Therefore, if limits are assigned to the rolling check, they will be influenced by the permissible amount of runout. Standard tolerances for total composite errors are unavailable at present, however, the American Gear Manufacturers' Association lists the values for runout, TABLE 1.

Fig. 3. Graph showing area ranges of tolerance for visual check. *Courtesy Detroit Transmission, GM.*



Significance of Tolerances

The tolerances are grouped according to pitch, pitch diameter and speed range. For many gears, however, the speed range is of no particular significance. In considering these, it should be borne in mind that the tolerances reflect not merely requirements for each speed range, but also the capability of the various manufacturing processes. Therefore, Class 3 or 4 tolerances might be applied to accurate index or change gears, even though their rotational speed would place them in Class 2. Because of the variety of requirements and purposes of gears it is impossible to establish a system of tolerances covering all contingencies. However, a thorough understanding of the nature of gear errors and intelligent application of tolerances will extend usefulness of the tolerances beyond immediate limitations of the charts.

Inherent limitations of gear rolling are apparent. If excessive errors were shown on the indicator or chart, it would be impossible to know whether the right-hand or left-hand profiles were at fault and whether the involutes or the spacings were off. As previously discussed, lead errors are not revealed

all and the same applies for any intentional modification for either lead or involute. Those questions must be settled by subsequent involute, lead and space checking.

The necessarily high investment, as well as the space requirements of gear checking equipment required, restricts even large gear producers with seemingly well-equipped laboratories. As a rule, such a producer has insufficient equipment for effective control of the process and often the laboratory is too far from the scene of production.

For both large and small producer there is still a valuable intermediate step between simple gear rolling fixtures and intricate analytical involute, space and helical lead machines. That is the analytical comparator shown in *Fig.* 1. In most cases, with the exception of large or fine-pitch gears, there is no reason why the master gear which is used for the rolling check could not be made like the gear which it is to check. If it were, it could be used both for rolling and for comparison of involute, spacing and lead.

Use of Comparators

The analytical comparator's advantage is in giving a combination of all checks. The table motion parallel to the axis compares lead. Perpendicular table motion checks involute or tooth profile and the in-and-out motion of the indicator slide checks spacing. Again, this type of check is only as accurate as the master gear.

It is possible to use masters without a full complement of finished teeth. Grinding fewer teeth facilitates higher accuracy. Such a master may have ½, ⅓ or ¼ the number of teeth of the actual gear. That eliminates a tooth-to-tooth check. Its place is taken by a space comparison over 2, 3 or 4 teeth.

Generally, spacing is a relatively stable function of the machine and needs checking only from time to time. Therefore, reducing the number of teeth in the master gear is a compromise in favor of higher accuracy of those components requiring constant control.

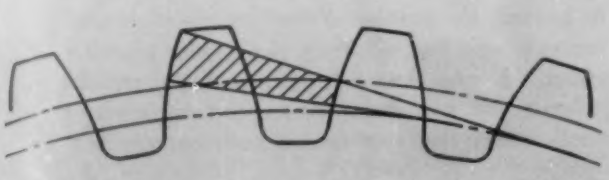
Analytical comparators can also be equipped with recording devices as shown in *Fig.* 1. Recording is an essential tool in control of gear accuracy because it indicates where and what adjustments have to be made to improve accuracy. Some highly refined gears cannot be inspected at all without the aid of recording. These are gears on which tolerances are close and the pattern is fixed. The working tolerances, rather than being expressed in figures, are shown as an area. Such a tolerance area may be etched on a piece of clear plastic and superimposed upon the graph to see if the actual lead or involutes are within the tolerance area, *Fig.* 3. A similar pattern may be visualized for involutes.

Such patterns anticipate deflections under load, mismounting and deformations in heat treatment. They usually follow the principle of "crowning" by placing the initial bearing at the best location. The maximum amount of error is best placed where it will do the least harm. While this system requires more control and inspection, it also permits the greatest possible tolerances with the least damage.

Checking machines which are built specifically for analyzing involutes, lead or spacing are not only the most accurate tools for the job but, as a rule, have additional features which permit a greater

Fig. 4. (right) Tooth space comparator used to check a spur gear.

Fig. 5. (below) Limitations of base pitch checking. This type of check is limited to the sectioned area.



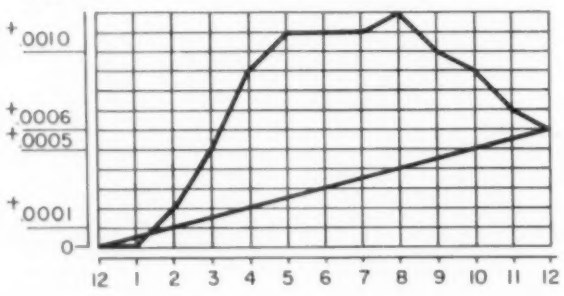
insight into the nature of gear errors. They are universal machines in the sense they can be set up in a short time to check any gear within their range. Thus they are the backbone of all gear laboratories.

For instance, for analyzing involutes, the base circle type of machine gives maximum accuracy. By definition every involute gear has one and only one base circle from which all involute surfaces of the teeth are generated. This base circle is not a physical part of the gear, but to engineers it serves as a means of defining tooth profiles and in base circle machines it serves as a means for checking them.

Checking tooth surfaces in the axial direction is done on simple fixtures if gears are spur gears, and on helical lead machines if the gears are helical. The tooth surface on a helical gear has the same lead at all diameters. Therefore, the lead check can be carried out at any radius between the root and outside diameters. Accuracy of straightness or lead is commonly related to tooth bearing and not to rotation. Conceivably, some lead errors could affect accuracy of the rotation in the way involute errors do, but the possibility is small and usually is ignored.

Spacing of gear teeth can be, and sometimes is, checked by optical dividing heads and index plates. Such a check is too slow to be of practical use in day-to-day control of gear quality. Most gears are not indexing gears but are meant to transmit power. Since only one or two teeth are in engagement at a time, manufacturers are primarily interested in

Fig. 6. Graphic addition or subtraction of space variations from baseline indicates accumulated error at any point.



variations in tooth spacing which affects smoothness of engagement rather than total index errors. Accumulated or maximum index errors are also important because they could not occur without variations in tooth spacing. However, since accumulations are a relatively stable function of the machine, they need checking only from time to time. Minimizing accumulated errors by maintaining machines helps minimize space variations.

Most space measuring machines in the industry are comparators. They compare spacing of the teeth and measure only variations. It is entirely permissible to consider involute and space tolerances simultaneously because they determine smoothness of engagement of a pair of gears. Therefore, greater involute tolerances may be traded for tighter space tolerances or vice versa. That sort of trading is automatically done in selection of the basic cutting process: hobbing produces better spacing but poorer involute, shaping has better involutes but relatively poor spacing.

The space comparator shown in *Fig.* 4, is a versatile, hand-operated model. It is more versatile than automatic checking machines because the indicator head can also be adjusted to compare normal pitch of helical gears and base pitch of all gears.

Base pitch is the circular pitch at the base diameter. It is also the distance between successive driving involutes measured along a line tangent to the base circle. All contact between two involute gears takes place on lines which are tangent to the base circle. Base pitch variations are therefore an indication of the smoothness of engagement because they are a combination of involute and spacing variations. The limitation of the base pitch check is that it can only be carried out over a limited area of the total active tooth surface, *Fig.* 5.

Other Gear Inspection Procedures

If an inspector wants to arrive at accumulated error and its location on the gear, he must process the measured variation as previously described. There is, however, another graphic method available which uses the measured variation directly.

In this the inspector enters the figures in a graph, consecutively adding variations to or subtracting from the previous one. A line connecting the end point with the starting point represents all correct tooth positions. The out-of-position of all other teeth is then measured from this line. The maximum difference between any two points from this line is accumulated error, *Fig.* 6.

The hand-operated space comparator is somewhat limited in ultimate accuracy because the measured space variations are usually small increments and easily subject to distortion unless great skill and patience are used. A completely automatic machine does not suffer from the same handicap, particularly if combined with recording.

From the discussion it is evident that gear inspection today is growing increasingly complicated in parallel with manufacturing methods. The problem is to find the proper type and degree of inspection. In general, the functional checking machines may be considered the policemen of the gear manufacturing process; the analytical machines are the judges. Any gear production operation, large or small, is controlled most economically by intelligent combination of basic checking procedures and machines.

true allowances

extend production tolerances

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ASSIGNMENT OF TOLERANCES appears to be simple but probably no other phase of design and production introduces as many underlying and far-reaching problems. The engineering department establishes tolerances on the basis of experience, specifications and tests. Fixtures and tools must be supplied to the shops by the tool department so the specified tolerances can be met at reasonable cost. Once parts are produced, the quality control department must inspect them to be sure they are within specified limits.

Since tolerances are assigned so that parts produced within the specified limits will fit and function interchangeably with all mating parts that are produced within their limits, the greater danger in tolerancing is misunderstanding. Drawings should be toleranced so that they will be interpreted the same by everyone who has contact with the drawing.

Tolerancing starts with the engineer and, in many instances, an improper interpretation is given to a dimension by the engineer or draftsman. As a drawing progresses through tooling, manufacturing and inspection departments, additional interpretations are made. For example, *Fig.* 1 represents two simple parts to be fastened together by two bolts or pins. *Fig.* 2 shows how the draftsman might interpret the dimensions and tolerances.

In the upper part, the holes are located at the maximum tolerance, 1.010 inches between centers.

Abstracted from paper 23C5B, "Size Tolerance Vs. Positioning Tolerance," presented at the 23rd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

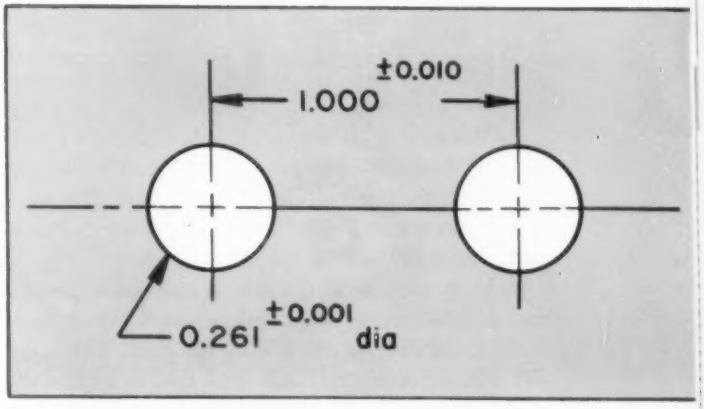


Fig. 1. Two simple parts, each with two holes, to be fastened together by bolts or pins.

In the lower part, the holes are located at the minimum tolerance, 0.990 inch between centers. Since the parts are to be held together by pins or bolts, the draftsman considers that the minimum hole will be drilled in the part and that the maximum diameter bolt will be used. He then determines the hole diameter that must be specified. In this instance, it would be minimum and the drafting job would be done.

This represents an incomplete interpretation of the conditions. The centerline dimension and tolerance govern position, the diameter tolerance governs geometery. Actually, the part is satisfactory so long as the bolts will enter both holes in both parts. The draftsman has considered only one condition, namely, as the British call it, "maximum metal condition."

One of the hole combinations of *Fig.* 2 is shown enlarged in *Fig.* 3. As long as the holes are minimum diameter, the drawing specifies the correct centerline tolerance—shown solid. If the hole, however, is toward the maximum size, the centerline tolerance can be increased. This condition is usually neglected. To make full use of the true allowance, skillful interpretation is required.

At Bendix, the various departments have arrived

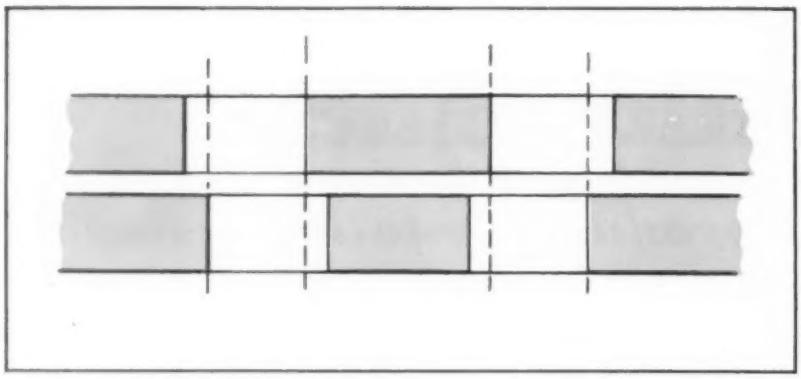


Fig. 2. Draftsman's possible interpretation of the tolerances shown in *Fig.* 1.

at an interim method of insuring use of true allowances. Drawings are dimensioned as in the past but the following note is added: "Centerline location of holes can be checked by using gage #XXXX." The gage to suit this example would be a simple pin gage designed so the sum of the gage pin diameters would equal the sum of the minimum hole diameters minus the total centerline tolerance. Pins would be located on the nominal centerline dimension. In this case, the pins would be located 1.000 inch apart and each would be 0.250 inch in diameter.

Holes in the part would first be checked to be sure that their diameters were within limits. Their locations would then be checked by the gage. This gage will pass as acceptable any part that is within the strict interpretation of the drawing and, also, any part that is acceptable on the basis of accumulated location and geometric tolerance.

Effects of location tolerance with respect to size tolerance have not been discussed because a realistic method of defining location must be determined before its tolerance has any real meaning. The size of a hole is often determined by factors other than a combination of geometry and location. Other stipulations, such as press fits, bearing fits and packing fits, must be met. Once the basic hole requirement has been established and, supposing that dimensions are interpreted the same by everyone and a gaging technique is established, the location tolerance comes out as required.

Referring again to *Fig.* 1, the holes are designated as 0.261 $\pm$0.001 inch in diameter, 1.000 $\pm$0.010 inch apart. The gage for these parts would have 0.250-inch diameter pins placed 1.000 inch apart. If the tolerances for holes and centerline distance were switched, the gage would remain the same, according to the previously mentioned formula, and only acceptable parts would pass in either case. The choice of tolerances thus depends on the requirements of inspection, production or engineering departments. If the pin gage is acceptable, the larger hole tolerance is preferred; if it is not acceptable, the larger centerline tolerance is acceptable.

From this example, it can be seen that the true allowance is usually, if not always, the geometric sum of both location and size tolerances.

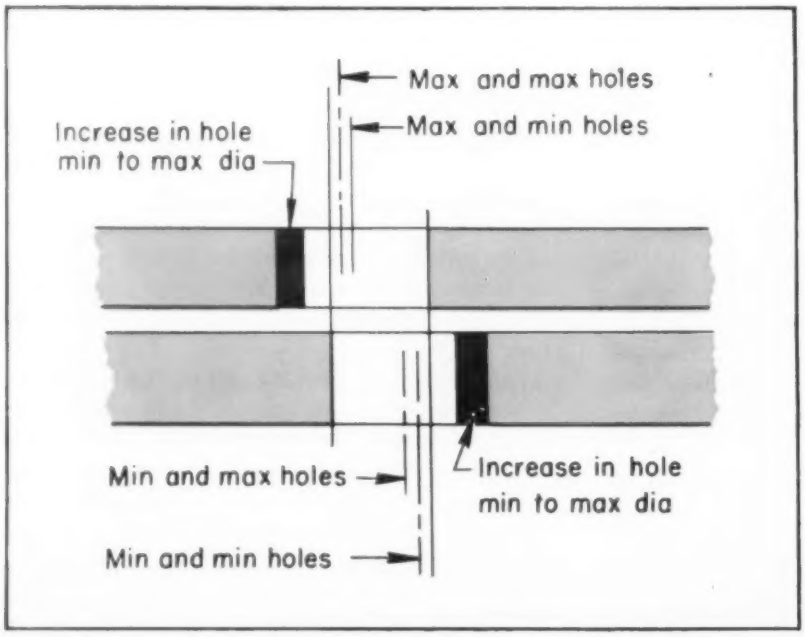


Fig. 3. An Indication of true allowances is shown in this enlargement of one of the bolt holes shown in *Fig.* 2. Skillful interpretation of the actual physical conditions involved can lead to wider tolerances and full use of the true allowance.

EPOXY TOOLS *have wide application*

By **John Delmonte**
General Manager
Furane Plastics, Inc.
Los Angeles, Calif.

Fig. 1. Epoxy stretch-press tool manufactured by Consolidated-Vultee weighs 2700 lb.

ADVANTAGES OF LIGHT WEIGHT, ease and speed of preparation, and specific qualities of epoxies that aid in design and manufacture of tools have caused a rapid increase in the application of plastics as tools, *Fig.* 1. Plastics have limitations but when these are known good tool design can result. Thermosetting epoxy resins form rigid structures after the addition of amine type hardening agents. Possessing the lowest polymerization shrinkage of currently used tool plastics, epoxies also have high strength and exhibit good adhesion.

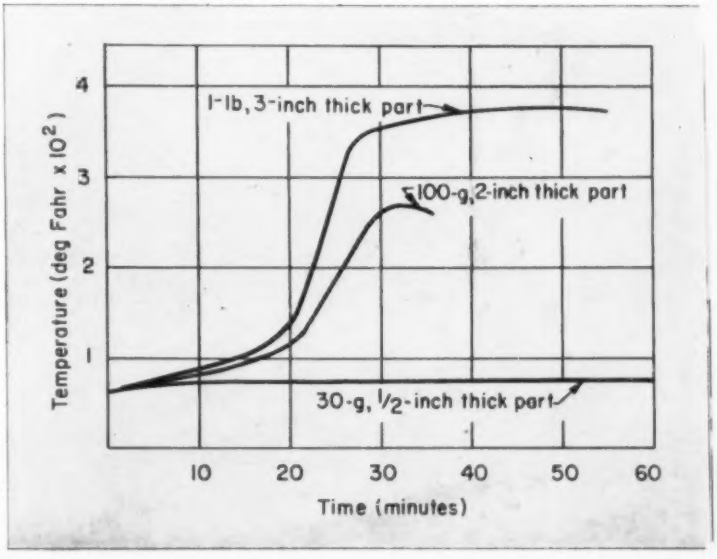
Shrinkage is the evidence of internal changes and depends on several factors. The polymerization or cure shrinkage represents a loss of volume as the liquid epoxy resin molecules are chemically cross-linked by their hardening agents. Magnitude of this shrinkage is usually less than 1 percent.

Temperature at which the resin sets has a controlling influence on shrinkage. The higher the setting temperature, the greater the shrinkage. Since most hardeners for epoxies induce exothermic (heat given off) reactions, it can be seen that shrinkage can be reduced by using that hardener which generates least heat. However, hardeners have additional characteristics which prevent selection on the basis of reaction temperature alone.

Reactive hardeners quickly set the epoxy but cause high temperatures. Slow hardeners may lead to excessively long setting cycles. It is possible to use hardeners that induce endothermic (heat absorbed) reactions, but hardening systems must be tailored to individual applications.

Large masses of epoxy resins have short gelation times and high gel temperatures as compared to small masses with the same catalyst concentration. *Fig.* 2 illustrates the temperature rises of three identically formulated epoxy parts of different sizes.

Fig. 2. Parts of different masses made from the same epoxy formulation and with identical percentages of the same hardener have different gel times and reaction temperatures.



Abstracted from paper 23T5, "Tool Manufacture as Influenced by Properties of Epoxies," presented at the 23rd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

Epoxy resins with fillers react in the same way but with less marked differences. Gel time and temperature can be satisfactorily controlled in large masses, as illustrated by the epoxy stretch-press tool shown in *Fig.* 1.

Concentration of the hardener, as well as its type, affects heat generation during gelation. An excess of hardener can cause excessive shrinkage because of the high temperature of the reaction. Recommendations on minimum hardener additions should be closely followed. Moisture content of the resin-hardener system can influence exothermic heat generation.

Inert fillers can influence the temperature of the reaction, although they are not primarily used for this purpose. Even in laminating, glass cloth serves as a filler and dissipates heat to reduce shrinkage to less than 0.1 percent. For a given tool thickness and a fixed epoxy-hardener ratio, shrinkage lessens as the amount of filler increases. However, excessive filler may introduce problems with fluidity and workability.

Fig. 3. Specially formulated epoxy has great flexibility and is used as a tube-bending mandrel.

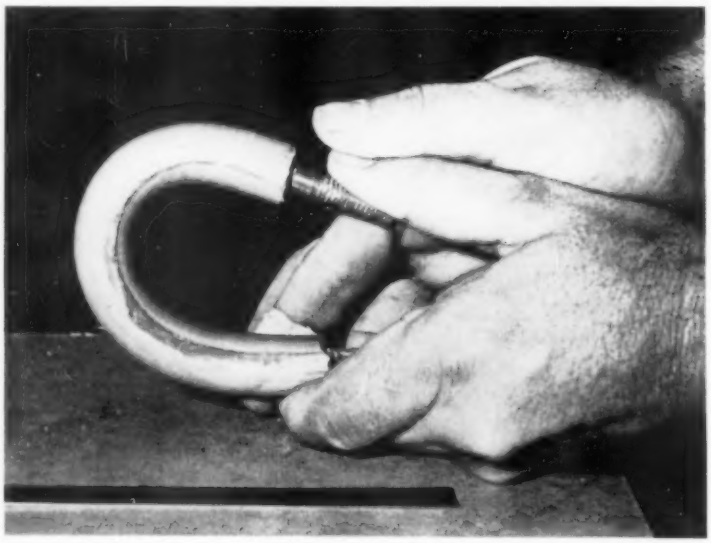
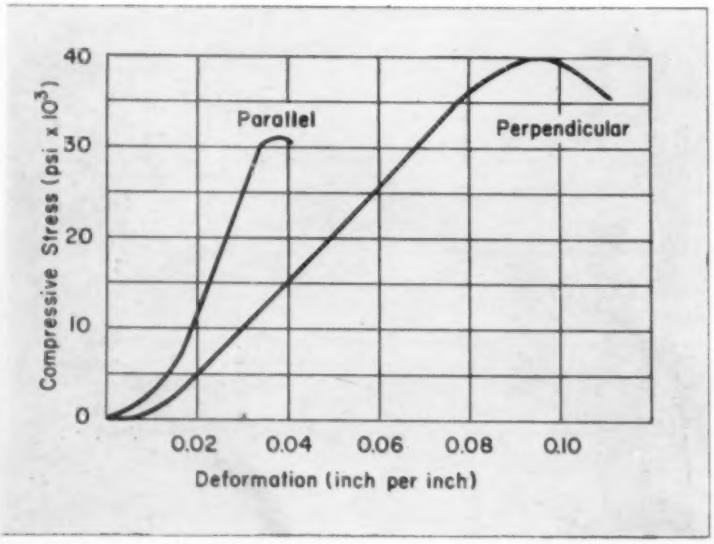


Fig. 4. Stress-strain curves for laminated epoxy material perpendicular to and parallel with laminations. Samples were cut from a glass cloth reinforced laminate with 52 percent resin by weight.



Physically, epoxies vary from soft and rubbery to hard and brittle materials. Selection of the proper formulation depends on the function of the tool. It is frequently necessary to sacrifice one desirable property in favor of another more desirable property. Strength of a part depends on cure temperature and on use temperature. For example, rubber-like impact tooling can shatter if it is stored in a cold place and not warmed before using. A tube-bending mandrel, *Fig.* 3, could not be bent at a temperature of 30 F without fracturing. Epoxies that set at room temperature should not be used at operating temperatures over 130 F. Dimensional stability is unsatisfactory at high temperatures but some heat-resistant formulations are now available for operation up to 300 F.

A stress-strain curve, *Fig.* 4, obtained in the operating temperature range of a tool is one of the most useful technical aids to the proper use of a tool plastic. The ratio of stress to strain within the elastic limit (modulus of elasticity) indicates material stiffness. Tools requiring stiffness are benefited by a high modulus of elasticity. If the tool must be flexible to fit over a part, a lower modulus is required. A typical cast epoxy would have a compressive modulus of 500,000 psi.

Area under the stress-strain curve should be considered equally with the slope of the curve because it indicates the toughness of the material. Surface hardness and ultimate strength can be sacrificed by addition of plasticizers but modulus is lowered and toughness is increased. For maximum toughness, glass cloth reinforcement is necessary. Simple cast epoxy impact tools are adequate for forming aluminum alloys, but glass-laminated tools are required with cold-rolled and stainless steels.

Because epoxies are used to face metals, hold metallic inserts and bond glass cloth, adhesion is important. When set under mild alkaline conditions, epoxies do not attack metals and adhesion is high. Surface hardness of epoxy tools depends on the filler and readings of 65-70, Barcol, have been obtained with some grades of aluminum oxide filler. The normal hardness usually ranges between 35 and 40, Barcol.

Extended application of excessive stresses to epoxy tools is undesirable because it can lead to warping. At 75 F, elastic limit of a rigid, cast epoxy is 5,000 psi and for a typical laminated epoxy is 15,000 psi. When designing tools with epoxies, it must be recognized that they do not have the stiffness or high-stress limits of steel.

Method for Determining Drill Size To Form Tapered Pin Seats

By Donald E. Sweet
Marblehead, Mass.

WHEN IT IS FREQUENTLY REQUIRED to select the proper size drill for forming the basic hole prior to reaming a tapered pin seat in a shaft or pulley hub, the nomogram on the following page can save computation. The nomogram indicates the correct drill size if the major diameter of the pin, the shaft diameter and the taper per foot of the pin are known.

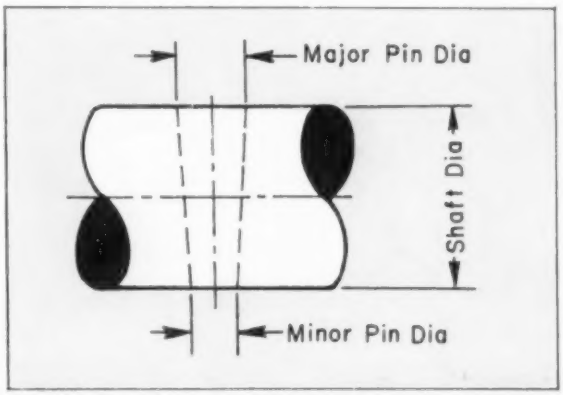
Limits of the nomogram are: major pin diameters from 0.100 to 0.260 inch in steps of 0.001 inch, shaft diameters from 0.5 to 2 inches in steps of $\frac{1}{16}$ inch, and the two most widely used tapers of 0.250 and 0.500 inch per foot. Scope of the nomogram can be extended by multiplying all scalar values by a common factor.

The nomogram is used by locating the major pin diameter on the left-hand scale and the shaft diameter on the right-hand scale. The right-hand scale is actually two scales; the portion on the left is for shaft diameters when the pin taper is 0.500 inch per foot and the portion on the right is for shaft diameters when the pin taper is 0.250 inch per foot. A line is drawn to connect the points for major pin diameter and shaft diameter.

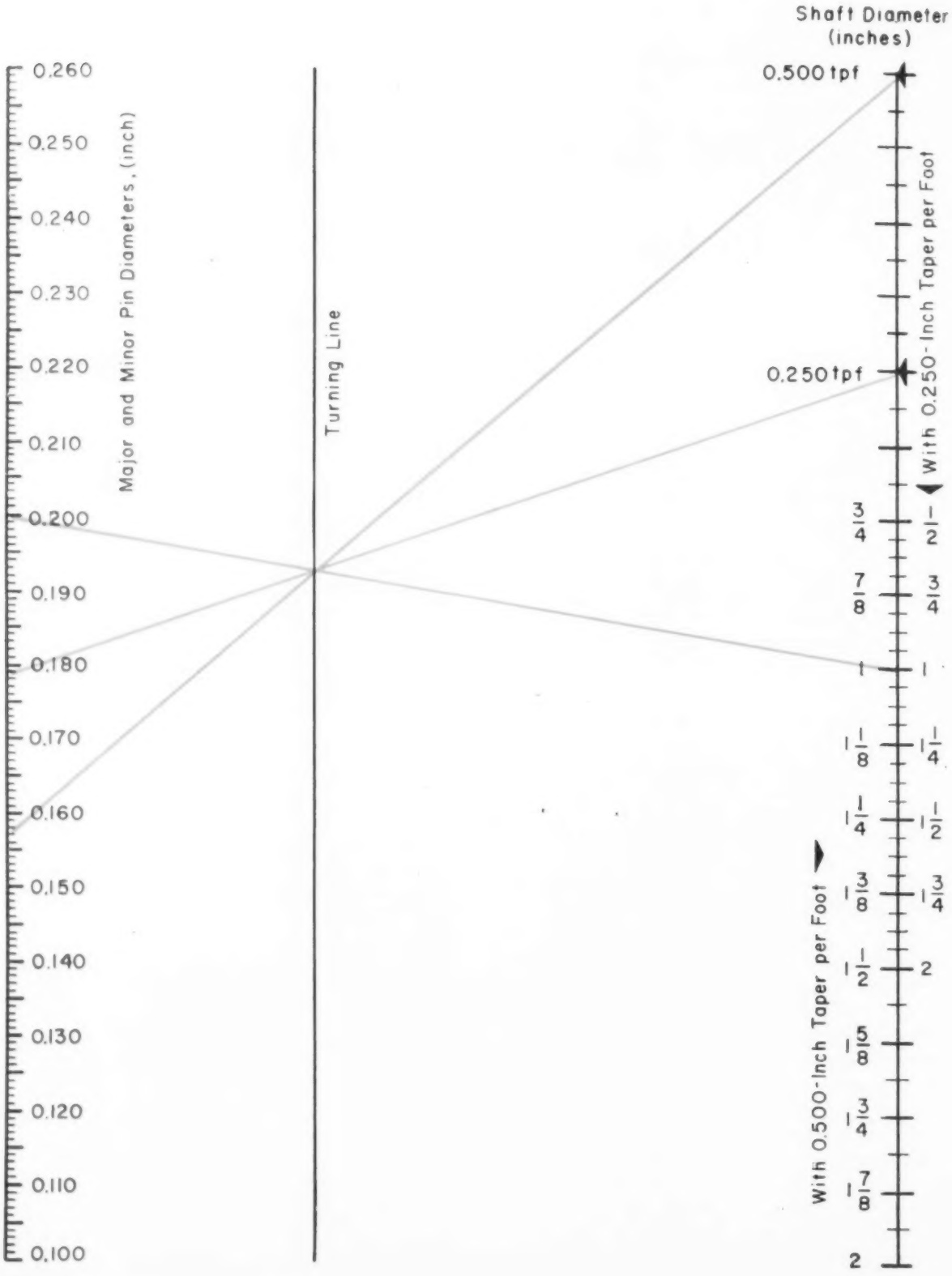
This construction line intersects the turning line at a specific point. If a line is drawn from the correct point (either "0.500 tpf" or "0.250 tpf") on the right-hand scale through the intersection of the first line and the turning line, and extended to the left-hand scale, it will intersect at a point equal to the minor pin diameter. This diameter is also the size of the required drill.

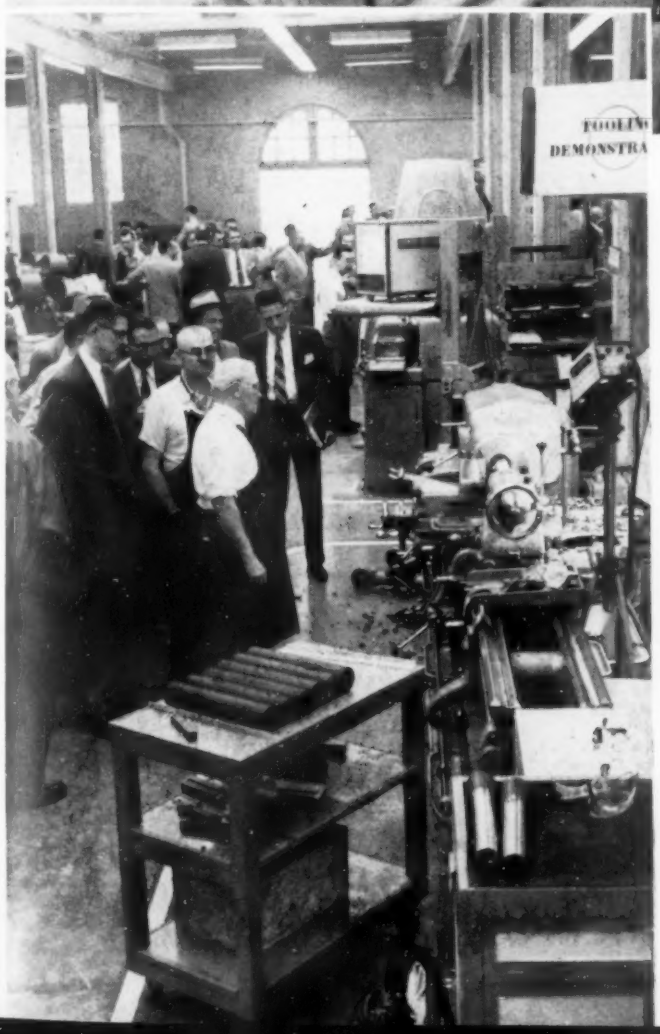
EXAMPLE: Given a major pin diameter of 0.200 inch and a shaft diameter of 1 inch, determine the correct drill sizes for pins tapered 0.250 and 0.500 inch per foot.

SOLUTION: Connect 0.200 inch on the left-hand scale with 1 inch on the right-hand scale (as shown in color on the face of the nomogram). From the intersection of the turning line with this construction line, draw lines connecting the 0.250 and 0.500 inch per foot taper points. Drill sizes for each taper are indicated on the left-hand scale: 0.179 inch for a pin with a taper of 0.250 inch per foot, and 0.158 inch for a pin with a taper of 0.500 inch per foot.



Nomogram To Determine Drill Size for Tapered Pin Seats





Tooling demonstrations at Purdue University's On-Campus Conference were viewed by nearly 400 members and guests attending the all-day program at West Lafayette, Indiana. Additional photographs are on page 126.

NEWS

featured this month

chapter news

Anderson

Arndt

Chesis

Garrett

Graham

education award *Winners*

Recipients of ASTE's International Education Awards for 1955 have been announced by Harry B. Osborn, Jr., president of the American Society of Tool Engineers.

Ten scholarship awards totaling $7,000 are made annually to outstanding engineering students throughout the country. Judging is based on scholastic standing, faculty recommendations and interest in furthering the profession of tool engineering.

This year's awards of $700 each go to: Karl O. Anderson of Detroit, Mich., graduate student at Wayne University, Detroit; Herbert L. Arndt, Jr., of Columbus, Ohio, senior at Ohio State University, Columbus; Sheldon Chesis of Brooklyn, N. Y., senior at City College of New York, New York City.

Everett E. Garrett, Jr., of St. Joseph, Mo., senior at University of Kansas, Lawrence; Donald C. Graham of Ann Arbor, Mich., senior at University of Michigan, Ann Arbor; Nicholas Kralles of Reading, Pa., junior at Pennsylvania State University, State College; Karlis Murnieks, junior at University of Toronto, Toronto, Canada.

Phillip A. Reed of Ionia, Wis., senior at University of Wisconsin, Madison; Allan E. Russell, West Lafayette, Ind., junior at Purdue University, West Lafayette; Phillip Sexton of Fountain City, Tenn., junior at University of Tennessee, Knoxville.

Selection of the award winners was made by the 1954-55 National Education Committee, under the chairmanship of Robert E. McKee, professor of production engineering at the University of Michigan.

Other members serving on the committee included: Myron L. Begeman, chairman of the mechanical engineering department, University of Texas, Austin; Charles C. Lasater, assistant professor of mechanical engineering, University of Tennessee; Orville D. Lascoe, professor of manufacturing processes, Purdue University; Cyril R. Mitchell, development engineer, Anthes-Imperial Co., Ltd., St. Catharines, Ont., Canada; Richard B. Niebusch, division tooling manager, Cincinnati Milling Machine Co., Cincinnati, Ohio; Frederick Preator, head of the tool engineering department at Utah State College, Logan; and Carl J. Oxford, Jr., research engineer, National Twist Drill Co., Rochester, Mich.

Kralles

Murnieks

Reed

Russell

Sexton

Can Borides Be Used as Cutting Tools?

ASTE Research Fund seeks answer

Tungsten carbide outdated machining speed standards adopted prior to its introduction and has dramatically captured the attention of production engineers everywhere. There is still much to be learned about the family of carbides but for reasons of national security and normal curiosity, other possibilities must be investigated too. Relatively little is generally known about borides as tool materials but some fantastic claims have been made for them. Contrasted to the expense and strategic position of tungsten carbide, some borides can be produced from relatively inexpensive materials that are plentiful. To separate the facts from the claims, and perhaps herald the emergence of a new group of "wonder" cutting materials, the Research Fund Committee of the American Society of Tool Engineers has instituted a study into the possibility of using borides for cutting tools.

Borides of certain transition metals have metallic natures, and seem to have hardnesses and strengths sufficiently high for use as tooling. It is anticipated that particular grades and specific production processes can be developed so that borides could be competitive with carbides both in cost and performance. Actual investigation of cemented boride composites and cutting tests will be handled by the Ceramics and Minerals Dept., Armour Research Foundation, Illinois Institute of Technology, under direction of an ASTE steering committee (see box).

A broad range of properties should be possible in cemented composites by changing ratios of the constituents, varying particle sizes, and altering sintering temperatures and times. Titanium, tantalum, zirconium, vanadium, chromium, molybdenum and tungsten borides will be investigated. However, major emphasis will be expended toward finding composites that can be made from inexpensive, nonstrategic materials.

Borides are hard but they are also brittle. To raise their impact strengths, some type of binder must be used. Metallic binders would be used for several reasons. First, refractory components are

Steering Committee For Cemented Borides Project

E. W. Engle, Manager
Cemented Carbide Products Engineering
Carboloy Company
Detroit, Mich.

R. W. Brown, Manager
Metallurgical Application
Materials Engineering
Westinghouse Electric Corp.
Pittsburgh, Pa.

F. S. Badger, Vice President
Haynes Stellite Company
Kokomo, Ind.

L. A. Tyner
Manufacturing Research Department
Ford Motor Company
Dearborn, Mich.

R. Hook, Chief Metallurgist
Warner & Swasey Company
Cleveland, Ohio

Representing ASTE Research Fund Committee:
G. W. Trichel, Executive Vice President
Amplex Division
Chysler Corporation
Detroit, Mich.

ost readily prepared as powders. Second, the elting point is so high that direct sintering of the wders without a binder would require impracically high temperatures. Also, the transition metals hat would probably be used have large numbers f bonding electrons per ion and may be expected o impart some ductility to the composite.

Phase one of this project will be concerned with he preparation and study of boride composites. Each composite will be tested for hardness, ultiate strength and metallic characteristics. Composites will be formed into shapes by simultaneous pplication of pressure and heat.

For any substance to be seriously considered as a tool material, it should have a minimum hardness of 85-90 Rockwell A, and over 100,000 psi transverse rupture strength. Those boride composites that meet these general requirements will be made into tool forms and tested by cutting tool steel (210 Brinell), aluminum, free-machining brass and gray cast iron. Results of these cutting tests, phase two of the project, will be compared with results obtained by carbides.

It is anticipated that sufficient information can be obtained on various composites within a ten-month period so that cutting tests can be made in less than a year. The steering committee has met with the Armour staff and work is already in progress. Results will be published as soon as they have been correlated and evaluated.

New Headquarters Offices for British Production Engineers

Members of ASTE who may be visiting England this summer, or any other time for that matter, are cordially invited to visit the new offices of the Institution of Production Engineers, British counterpart of ASTE. Because of the close ties which bind the two societies, ASTE visitors will find an especially warm welcome at IPE headquarters located at 10 Chesterfield St. in London.

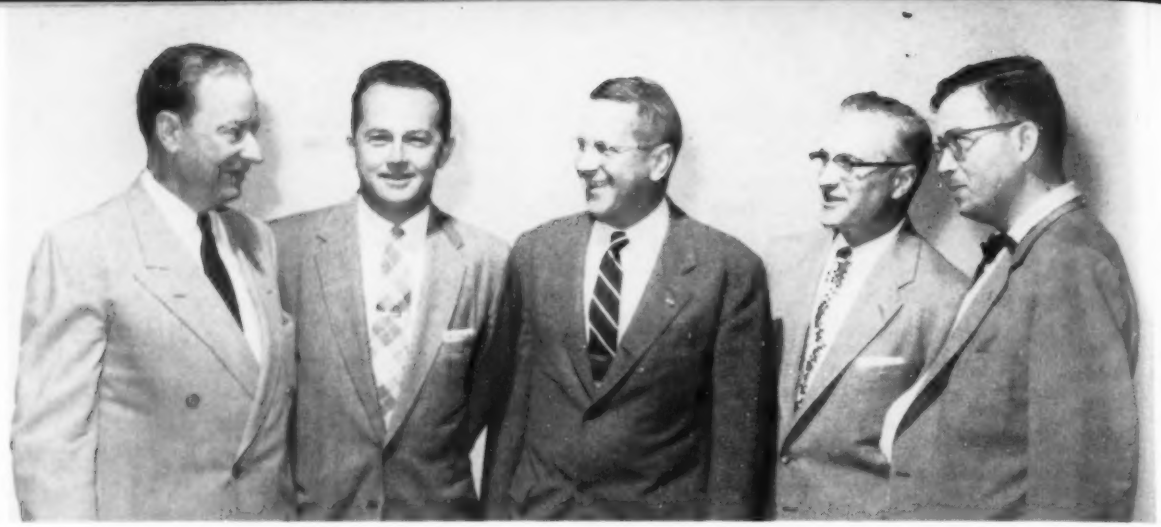
The 27-room building, a beautiful Georgian mansion in London's fashionable Mayfair, was erected in 1760. It was recently restored and refurbished by the Institution's energetic secretary, W. F. S. Woodford, and a special committee consisting of the 1954-55 president, Sir Walter Puckey, and two past presidents, Lord Sempill and Major-General Appleyard.

The decor is in Wedgewood blue and white, and the furnishings are either antiques or beautifully made copies. Despite all the elegance, however, the three floors of offices remain very much a place of business for conducting the affairs of a society that now numbers more than 10,000 members.

Funds for the restoration were provided by gifts from the local sections or chapters, and from metalworking companies in all parts of the country.

Decor and furnishings of the entrance hall, above, and other public rooms were selected with the help and advice of Lady Sempill.

Meetings of the governing body of the Institution of Production Engineers are held in the Council Chamber, right.



Purdue's third annual on-campus conference, termed an outstanding success, was attended by nearly 400 members and their wives. Commenting on the gratifying turnout are: Dr. Frank C. Hockema, vice president of the university; Dr. Harry B. Osborn, Jr., president of ASTE; Joseph P. Crosby, immediate past president; Howard C. McMillen, first vice president; and Paul Vierling, Indiana Council chairman.

Purdue *conference*

Hosts at the April 23 conference included: Prof. Halsey F. Owen, Dr. George A. Hawkins, dean of the school of Engineering, and Prof. Orville D. Lascoe.

Participants in the panel on "Plastics in Tooling" were: Joe Enright, R. M. Houghton, W. R. Weaver, L. F. Bogart and W. A. Fletcher.

Taking part in the panel on "Cold Forming Processes" were: D. I. Brown, K. W. Moore, Jerome Krumpelman, J. S. Solomon and Harry Pelphrey.

Approximately 75 wives donned smocks to participate in the workshop on enameling metals. Exploring the intricacies of making an ash tray are Mrs. O. D. Lascoe, Mrs. H. F. Owen and Mrs. Fred Golden.

Society Charters

East Texas Chapter

Serving tool engineers in the industrial cities of Longview, Kilgore, Marshall, Greggton, Sulphur Springs and Tyler, the East Texas chapter was chartered March 25 by ASTE. Ceremonies were conducted by Second Vice President Harold E. Collins.

Officers of the chapter—the 126th of the Society—are: chairman, H. D. Garrison; first vice chairman, H. L. LaBaume; second vice chairman, Wilbur W. Suppe; secretary, William Van Blarcom; and treasurer, Laurence Hoffmann.

Mr. Garrison was given the chairman's pin by George Freeman, past chairman of Houston chapter. Irving Buck, who acted as toastmaster for the program, presented the gavel which was a gift of North Texas chapter. The membership kit was presented by Otis Traughber, past chairman of Houston chapter.

Special guests at the charter night included: Dr. Allen C. Tyler, dean of LeTourneau Technical Institute; William C. P. Poole, chairman of the Manufacturers' Association; and Rex Jennings, representing the chamber of commerce and the mayor of Longview.

Harold E. Collins, left, presents the charter for the East Texas ASTE chapter to Chairman H. D. Garrison.

The executive group of the chapter is being sworn into office by Mr. Collins, second vice president of the Society. Chapter officers pictured are: H. D. Garrison, H. L. LaBaume, Wilbur W. Suppe, William Van Blarcom and Laurence Hoffmann.

OKLAHOMA CITY MEMBERS

Receive ASTE Charter

Despite the hindrance of the most severe snow storm of the season, an attendance of 100 members and guests was on hand to witness the chartering of ASTE's 125th chapter at Oklahoma City. The event took place on March 21 at the Skirvin Hotel. Officiating at the ceremonies was Harold E. Collins, second vice president of the Society.

Special invited guests from the area included: Allen Street, mayor of Oklahoma City; Horace Thompson, representing the city manager's office; Dick Poole, chamber of commerce; and Col. W. H. Monay, director of maintenance engineering, Ticker Air Force Base.

Executive responsibilities in the chapter will be carried by the following officers: Arnold Everett, assistant plant manager of Folding Carrier Corp.; C. A. Leslie, Jr., co-owner and manager of Associated Industries; W. B. Haney, shop superintendent at National Machine Works; M. A. Winter, district manager of Marshall Supply & Equipment Co.; and R. I. Poust, general foreman of American Iron & Machine Works Co.

Major roles in the charter night activities were filled by Irving H. Buck of Dallas, membership captain; Orville B. Strahm of Wichita, membership lieutenant; Harold E. Collins of Houston, national second vice president; and George M. Hargreaves of Detroit, staff administrator at national ASTE headquarters.

Mr. Collins administers the oath of office to: Arnold Everett, chairman; C. A. Leslie, Jr., first vice chairman; W. B. Haney, second vice chairman; and M. A. Winter, secretary. Treasurer R. D. Poust was not present.

The 124th charter of ASTE was presented to the chairman of Monadnock chapter, Donald C. Emery, by the Society's president for 1954-55, Joseph P. Crosby, second from right. Other chapter officers, from left, are: Bert Dardani, Richard D. Swahnberg, Chester A. Werme and Maurice D. Towne.

Monadnock Chapter

Chartered at Keene, N. H.

Tool engineers of the Keene, N. H. affiliate of Twin States chapter received their own ASTE charter in February at ceremonies conducted by Joseph P. Crosby, immediate past president of the Society.

Chartered under the name of Monadnock, the chapter became the 124th to join ASTE. It had been active for about three years as a Twin States co-chapter.

Charter officers, installed at the dinner meeting at Winding Brook Lodge, are: chairman—Donald C. Emery, development engineer at Markem Machine Co.; first vice chairman—Humbert M. Dardani, chief process engineer at Miniature Precision Bearing Co.; second vice chairman—Richard Swahnberg, sales engineer for Kingsbury Machine Tool Corp.; secretary—Maurice D. Towne, machine setup man at Kingsbury Machine Tool Corp.; and treasurer—Chester A. Werme, research director for Central Screw Co.

The guest list for charter night included: Richard A. Smith, national ASTE director; Marvin J. Bunting, staff administrator representing national ASTE headquarters; Laurence Picket, mayor of Keene; E. J. Kingsbury, Sr., president, and E. J. Kingsbury, Jr., treasurer of Kingsbury Machine Tool Corp.; Henry Chase, methods engineer at Sealol Mfg. Co.; and Dr. William R. Frazer of Union Twist Drill Co., Athol, Mass.

Other special guests attending represented nearby ASTE chapters, with an especially large contingent of Twin States members, headed by F. J. McArthur, coming from Springfield, Vt.

The evening's technical program was presented by Malcomb Maynes of the Norton Co., Worcester, Mass. He spoke on "What's New in Barrel Finishing." The coffee talk was given by Victor Erickson, president of Johnson deVou, also of Worcester.

Alfred State Tech

James O. Horne, right, national director of ASTE, congratulates student Chairman Kenneth Nutt at the chartering program for Alfred State Tech chapter.

Joining the ranks of student chapters at the University of Michigan, Utah State College, University of Kansas and Wayne University, ASTE's fifth student group was chartered Feb. 22 at Alfred State Tech (State University of New York Agricultural and Technical Institute).

Chartering officer was James O. Horne of Rochester, member of the ASTE board of directors, who presented the charter and installed the student officers.

Serving for the next year are: chairman, Kenneth Nutt; first vice chairman, Millard Batsford; second vice chairman, George Cooper; secretary, Ruth Wilson; and treasurer, Ronald S. Stuart. Faculty advisor for the 40-member group is Roger F. Rawe.

Keynote speaker at the charter dinner was Paul B. Orvis, director of Alfred State Tech.

Invited guests included: John McMahon, dean of the College of Engineering; George S. Whitney, dean of the Industrial Division; George Braddon, assistant chief engineer, Air Preheater Corp. of Wellesville, N. Y.; Lester Chirgwin, president, Consolidated Tool Corp., Rochester; William B. Harrison, Sr., president of Allegheny Telephone Co. and chairman of the Institute Advisory Council; and J. F. Sullivan, production manager at the Worthington Corp.

These engineering students at Alfred State Tech officially became members of the American Society of Tool Engineers when their chapter was chartered on Feb. 22. Faculty advisor for the group is Roger F. Rawe, second from right in front row, of the mechanical technology department.

Purdue University

Student Chairman John V. Plenge receives the charter for the Purdue University chapter from Howard C. McMillen, first vice president of the Society, who also installed the officers of the new chapter.

Growth in ASTE's student membership received another boost on February 25 when the sixth student chapter was chartered at Purdue University at West Lafayette, Ind. Ceremonies were held at a charter dinner sponsored at the Memorial Union Building by the Indiana and Louisville, Ky., chapters of the Society.

Howard C. McMillen, national first vice president, presented the charter to student chapter Chairman John V. Plenge. Other officers of the Purdue University group are: C. R. Biteler, first vice chairman; Nick Kurek, second vice chairman; Miles Peterson, treasurer; and Robert Chambers, secretary.

Faculty advisor is Prof. Orville D. Lascoe, member of the ASTE National Education Committee.

Prof. Halsey F. Owen was toastmaster for the program. After introduction of members of the Indiana Council, a large contribution was given to the new chapter from the South Bend, Indianapolis, Fort Wayne, Richmond, Muncie, Evansville, Calumet Area and Louisville, Ky., senior chapters.

Making the presentation were Tom Barber, chairman of the National Program Committee for 1954-55, and Paul W. Vierling, president of the Indiana Council.

Principal speaker was Dr. A. L. Spalding, head of Freshman engineering at Purdue. He discussed the topic "Engineering Today."

After the banquet Marvin Bunting, ASTE staff administrator, discussed program planning.

Student members, officers and guests met at the Purdue Memorial Union for the charter night program.

Joint Meeting Held in Binghamton

A joint dinner meeting was held at the Arlington Hotel in Binghamton for members of the Binghamton ASTE chapter and members of Society of Professional Engineers of Southern New York State. Theodore Clement, appearance design coordinator at Eastman Kodak Co., was the guest speaker at this April 12 get-together. He gave a talk on industrial designing from the aspects of eye appeal to the general public.

A special note was made of the success of National Engineering Week in the area. Binghamton ASTE chapter played a major role as host of the annual dinner of the Technological and Engineering Council. Guest speaker at the dinner was Eugent Bordinat, Jr., chief of design for Lincoln Mercury Div. of Ford Motor Co.

—Glyn Williams

Little Rhody Hears Heat Treating Panel

A panel of metallurgists discussed "Heat Treating of Tools," for members of the Little Rhody chapter on April 7. Fifty-three attended the meeting held in the Pilot Room at Johnson's Hummocks.

Panelists were: Kenneth H. Mairs, associate professor at the University of Rhode Island; Wilson C. Pine, chief metallurgist, Universal Winding Co.; and Richard F. Harvey, chief metallurgist, Brown & Sharpe Mfg. Co. The combined panel offered a silver dollar for any question which they could not answer. No one collected.

Past Chairman William T. Nystrom reported on the Los Angeles Convention and gave his impressions of the trip as a national delegate.

—Richard H. Kilbane

FOND DU LAC—L. A. Kirby, right, accepts the distinguished service award from H. S. Faith, chairman. The occasion was Fond du Lac's installation and past chairmen's night. Movies were shown to the 125 in attendance depicting research and development program of the U. S. Air Force.—*Paul J. Leeser*

Grand River Members Tour American Can Co.

C. H. Donnelly, works manager of the American Can Co., welcomed 160 members and guests of the Grand River Valley chapter on April 22. The party, in groups of ten, was conducted through the entire plant.

On April 1, R. Andrews of Shell Cast Alloys, Ltd., was guest technical speaker. In discussing "Precision Casting of Plain and High Alloy Metals," Mr. Andrews pointed out the fractional percentage of scrap and low machining costs as advantages.

—W. C. Little

Elected Vice President

Wilfred J. Pender, past chairman of the Little Rhody chapter, has been elected vice president and factory manager of Potter & Johnson Co., a division of Niles-Bement-Pond Co., by the directors of Potter & Johnson. He had served as factory manager previously.

Detroiters Tour General Motors Plant

Detroit's ASTE members had a chance to inspect the production facilities of one of the largest and most modern transmission plants in the nation. On April 14 the group visited the Detroit Transmission Div. of General Motors Corp. at Willow Run. All got a close-up view of how Hydra-Matic transmissions are built.

On April 7, the carbide section met at the Rackham Building to premiere a showing of the film "Tools in Abundance" by the Wesson Co. Tony Rogers, second vice chairman, and Gregg Manchester, secretary, discussed the ways and means by which the carbide cutting tool industry is meeting present demands of better tool engineering through research engineering, metallurgy and information programs.

The education section met on April 21 for program on "Twist Drills and Drilling Theory and Practice." Speakers were Carl J. Oxford, Jr., research engineer, and Archie G. Bee, service engineer, both of National Twist Drill & Tool Co.

—Walter R. Schober

Little Rock Chapter Holds Executive Night

A special invitation went out to all local executives for the April 14 meeting of the Little Rock chapter. Held at the Hotel Marion, the meeting featured two speakers.

Pratt Remmel, mayor of Little Rock, gave an account of his recent visit to Germany as a guest of the German government. The coffee speaker was Richard J. Bacik, staff administrator from National ASTE Headquarters in Detroit, who spoke on "The Value of ASTE to the Community."

—R. A. McKinstry

RICHMOND—ASTE officers for 1955-56 include: Robert Greminger, treasurer; Lawrence Liebert, secretary; Bennet Matthews, chairman; and Charles Taylor, first vice chairman. Louis Fabian is the chapter's second vice chairman.

Past Chairman Clifton Bowman, left, presents the gavel to the newly installed chairman, Mr. Matthews.

PURDUE UNIVERSITY—J. Dellinger, chief engineer at the Alcoa Aluminum plant at Lafayette, Ind., discusses extrusion dies with the officers of the Purdue University Student chapter. From left: J. V. Plenge, chairman; C. R. Biteler, first vice chairman; M. L. Peterson, treasurer; Mr. Dellinger; Robert Chambers, secretary; and Nick Kurek, second vice chairman.—*Robert J. Kuntz*

B. F. Bower Addresses Evansville Members

B. F. Bower was the guest technical speaker at Evansville's April chapter meeting. Mr. Bower, president of Pines Engineering Co., discussed tube bending and bending equipment for 69 members and guests at Smitty's Steak and Sea Food House. He was assisted in his presentation by Gil Behrend, district manager of Pines Engineering. Both are members of Fox River Valley chapter. —*William H. Brooks*

Santa Ana Valley Holds Ladies' Night

Departing from a purely technical program, Santa Ana Valley ASTE members entertained guests at a special ladies' night meeting on April 5. The program included a fashion show and a film on copy lathe turning presented by J. E. Sullivan, western representative for the New Britain Machine Co.

The dinner meeting was held at the Waterwheel Restaurant in Anaheim.

—*Leonard Krow*

Tom Donovan Installs Williamsport Officers

Past national director of ASTE and president of the Donovan Co. in Philadelphia, Tom Donovan was the principal speaker and installation officer at Williamsport's March 23 program.

All past chairmen were honored and entertained by the chapter at this meeting. They included: Lester Lantz, Harold Shaffer, Delbert Lowrey, Louis Bardo, Ed Sears, Richard Huskin, Morris Smith, William McCoy and Joseph Gehret. —*Joseph E. Gehret*

F. Leroy Hill Elected Board Chairman at Camdale

At the annual, stockholders' meeting of Camdale, Inc. of East Detroit, Mich., F. Leroy Hill was elected chairman of the board of directors. A member of the Rockford ASTE chapter, Mr. Hill is president of the Hill Machine Co. in Rockford.

He is a graduate of the University of California and holds degrees in mechanical and electrical engineering. His experience in the manufacture of precision parts and components for the aircraft industry includes many years as president of Air Associates, Inc.

Camdale, Inc., specializes in cams, gages and other intricate parts for reciprocating and jet engines.

Vocational Class Invited to Central Pennsylvania

By special invitation of the Central Pennsylvania chapter, 40 members of the senior vocational class of the Pennsylvania Soldiers and Orphans School of Scotland, Pa., visited York Corporation on April 20. With them were members of the faculty: C. A. Goldstrom, director of vocational education; Calvin Eicher, electrical shop instructor; Charles Sanders, wood shop instructor; Clyde Pensinger, print shop instructor; and Ralph Patterson, machine shop instructor.

The guests arrived in York from Scotland, 52 miles away, at 1 p.m. Following a conducted tour of the machine shops, assembly line foundry and other manufacturing facilities of the York Corp., a turkey dinner was served in the York Corp.'s Technical Institute dining room.

Dr. Edwin L. Rumpf, director of vocational education in York city schools, addressed the group on "Opportunities for a Trade School Graduate." Members of the Central Pennsylvania chapter representing various fields of work acted as a panel in answering many questions.

The students were then taken to the auditorium of the Institute where various manufacturers had set up displays of tools and tooling fixtures. A tired but happy group boarded the buses for the ride back to Scotland that night. The chapter wishes to thank David A. Schrom, chairman of the committee than handled arrangements for the day and who acted as toastmaster at the dinner. —*Paul F. Leese*

WILLIAMSPORT—The chapter's March technical program on heat-treating problems, which was televised by station WBRE-TV, was presented by Tom Donovan, far right, president of the Donovan Co., Philadelphia, and a past national director of the Society. Pictured with the speaker, from left, are: Lester Zimmerman, William Beach, Robert Davis, George Lunt and Dale Chubb.

HENDRICK HUDSON—Committee chairmen for 1955-56 in the Hendrick Hudson chapter include: from left, William Edmiston, education; Ernest J. Heyman, constitution and by-laws; Malcolm S. MacKenzie, program; Howard Bancroff, membership; Joseph Gorczyca, standards; and Benet Ripin, public relations. Not pictured are: Pat Bruno, finance; and Charles De Barbieri, advertising.

WORCESTER—At the April meeting, 150 members of ASTE and ASQC toured the new Boys' Trade School and viewed the "Civilization through Tools" exhibit presented by The DoAll Co. Shown here: J. Irving England, ASTE chairman; Franklin Angevine, ASTE education chairman; C. G. Schelley, managing director of the Wilkie Foundation; Mr. Dennen, director of the Boys' Trade School; and Les Tarasov, ASTE first vice chairman.—*Ronald H. Mead*

PHOENIX—National Director A. B. Clark, far right, installed Phoenix chapter officers at the March meeting. Seated: J. Clifford Ford, second vice chairman; Robert Kimball, secretary. Standing: C. Harold Conner, chairman; Willard L. Groene, first vice chairman; John Hamay, treasurer; and Mr. Clark. Guest speaker was J. M. Pitblado of Minnesota Mining and Mfg. Co. who showed a film on industrial applications of coated abrasives.—*Alex Ratkovich*

Installation Held by Hendrick Hudson

Members of the Hendrick Hudson chapter who met at the Circle Inn on April 20 witnessed installation of their 1955-1956 officers by James O. Horne, national director of ASTE. Another special guest was W. W. Schug, immediate past chairman of the National ASTE Membership Committee.

The chairman's award pin went to Fred T. Gras, Jr., young son of the chapter's first treasurer who died a year ago. The presentation was made by Retiring Chairman Lisle Morse.

A working display of various blueprint and photocopying machines as well as drafting and engineering equipment aroused a lot of interest at the meeting. It was sponsored by Ray Schofield of the W. L. Coughtry & Co.

—*Benet Ripin*

Golden Gate Hears F. K. Schallenberger

Describing the techniques and advantages of the shell molding process and its adaptation to production uses, Frank K. Schallenberger spoke before 145 members and guests of the Golden Gate chapter. Mr. Schallenberger is president of Shalco Engineering Corp.

The whole group adjourned to the Magna Engineering Co. for a firsthand demonstration of the shell molding process, but not before Gustave (Ben) Berlien, a member of the National Education Committee and a past chairman of the Golden Gate chapter, presented past national director pins to Andrew E. Rylander and Karl L. Bues. This April 20 meeting was held at Spenger's Restaurant.

—*John Wilson*

Dr. L. D. Tarasov Speaks to Calumet

Dr. Leo D. Tarasov of the Research and Development Department of the Norton Co. was guest technical speaker at the Calumet Area chapter's April 11 meeting. Starting with the history of grinding, Dr. Tarasov went on to discuss specific points to remember when grinding titanium and tool steels, as well as the grinding index and methods of crack detection.

Chairman Dave MacGregor named the heads of his various committees and introduced them to the membership. A special guest was L. J. Schnitzer, vice president and director of research, Inland Engineering, Inc.

—*L. W. Montgomery*

New Baltimore Officers Installed at Meeting

The March 4 meeting of the Baltimore chapter was highlighted by installation of officers, a dinner and dancing. The oath of office was administered by Harry B. Mecaslin, member of the chapter's advisory council, who also presented the appropriate pins to Past Chairman Richard W. Coleman and Leroy Rubright, newly elected chairman. Two hundred attended the event.

Committee chairmen who will serve the chapter for the coming year are: Ernest Russell, constitution and by-laws; Raymond T. Crew, editorial; Harry Mecaslin, professional engineering; Jim Rodgers, program; Donald Dorff, public relations; Walter Taylor, education; Neil Heller, membership; Alexander Wolak, standards; Wade Turner, advertising; and Paul Kline, entertainment. *—Raymond T. Crew*

Tom Kurtzer Addresses Kansas City Chapter

When the Kansas City chapter met in the Paseo Room of the American Legion Building on April 6, guest technical speaker was Tom Kurtzer. Mr. Kurtzer, electrical engineer for the Consolidated Engineering Corp., explained existing theories of vibration and their detrimental effects on machine tool life.

Special guests from the University of Kansas attended the meeting. They were: Prof. Paul G. Hausman, Prof. Arthur Paul and Mr. Howard Rust, faculty advisor of the University of Kansas student chapter.

—G. E. Brunson

Uses of Sheet Plastics Covered by David Jones

A talk centered on the development and uses of sheet plastics, especially in the field of packaging, was given April 19 at a meeting of the Northern Massachusetts ASTE chapter. Speaker was David Jones, technical service engineer, Celanese Corp. of America. He pointed out that all sorts of tools can be packaged attractively from the merchandising standpoint, thus encouraging increases in sales.

A few days before this technical session, the chapter held its first 'smoker,' thus establishing something new in the way of social get-togethers for its members. All types of games were played, light refreshments were served and entertainment planned for future meetings. More than 50 members attended and agreed to add this type of meeting to the regularly planned sessions.

—Otto S. Nau

BALTIMORE—Richard W. Coleman, left, retiring chairman, presented Donald E. Wernz, past chapter chairman and member of the National Editorial Committee, with the Baltimore chapter's annual merit award for outstanding service.

350 Turn Out for Windsor Ladies' Night

Some 350 members and their wives attended Windsor's annual ladies' night program held in April at the Lakewood Golf and Country Club. Sid Levine and his orchestra furnished music for the dinner dance. A total of 70 prizes was awarded during the course of the evening. *—F. D. Rail*

Lima Members Tour Sylvania Plant

How television tubes are made from start to finish was viewed by members of the Lima chapter on April 7, when fifty visited the Sylvania Electric Co. in Ottawa, Ohio. The group saw tubes polished, washed, cleaned and dried, coated with aluminum and painted on the inside. In final stages the group watched while tubes were tested, marked and packaged.

—John R. Harman

Dayton Holds Joint Meeting with AWS

Suttmiller's Restaurant was the scene of Dayton chapter's April meeting, a joint affair with the officers and members of the American Welding Society. Albert T. Van Cutsem, guest technical speaker, discussed "Resin Bonded Aluminum and Brazed High Temperature Sandwich Construction."

Mr. Van Cutsem, an engineer with Glenn L. Martin Co., related his discussion specifically to sandwich construction in the Matidor Guided Missile, otherwise known as the B-61 pilotless bomber.

The March meeting was devoted to installation of officers. Among highlights was the presentation of the outstanding service award to R. A. Miller, past chairman, for his job as editor of the local program. New Chairman Victor J. Boll took over the meeting

Miller

Boll

for the first time and awarded Retiring Chairman Dusseau with the past chairman's pin. The evening program also included a technical session on "High-Speed Feed Equipment and Press Maintenance." The speakers were Harry Burke, chief engineer, and Mike Bortak of the Die Engineering Department, both from E. W. Bliss Co.

—W. J. Killinger

DECATUR—Executive responsibilities rest with this group of five men in the Decatur chapter. They are: seated, Arthur Gatts, chairman; and Louis Gleason, first vice chairman. Standing are: Wilbur Jahr, second vice chairman; Paul Taylor, secretary; and Burnace Ball, treasurer.—*Paul Taylor*

Denver Members Install New Officers

Installation of officers and entertainment were the main objectives of the Denver chapter's March 8 meeting at Cunningham's Restaurant. New officers who were sworn in by Past Chairman Clinton Helton are: Norval Allen, chairman; George Buckel, first vice chairman; Clyde Elliot, second vice chairman; Robert Farnsworth, secretary; Ernest Ritchie, Jr., treasurer; and Willard Krieger, national delegate.

Byron McPherson received the chairman's special award pin for his outstanding job as editorial chairman on the Denver monthly bulletin. *The Rocky Mountain Tool Engineer.*

Entertainment was provided by Robert Smith, coordinator of music, City and County of Denver, whose program consisted of varied and colorful piano repertoire calling for group singing and intermixed with Scottish humor.

Willard Krieger, retiring Denver chairman, pins the chairman's pin on newly elected Norval Allen.

The following committee appointments were made by Chairman Allen: Russell Anderson, program; Henry Rudolph, membership; Douglas Williams, education; Willard Pratt, professional engineering; Harold Beaverstadt, calling; John Nosler, standards; and David Proper, editorial.

—David S. Proper

Northern New Jersey Hears Dr. Frazer

A lecture on modern trends in drilling was presented April 12 by Dr. W. R. Frazer, chief metallurgist, Union Twist Drill Co., at a meeting of Northern New Jersey ASTE members. A question and answer period followed.

During the business portion of the meeting, Chairman William K. Perru presented the past chairman's pin to H. Wilson Ryno.

—Sherwin W. Haas, Jr.

INDIANAPOLIS—Chapter functions will be carried on for the coming year by these newly appointed Indianapolis committee chairmen. The front row includes: Harry B. Green, programs; H. D. (Pop) Hiatt, permanent historian; James H. Huff, membership; and Orville Kallin, reservations. In the back row are: A. Borneman, public relations and bulletin; Herman W. Stoelk, education and student activities; Jack Bridges, constitution and by-laws; and Al Greeno, photography.

History of Tools Shown in Long Island Exhibit

The widely traveled program, "Civilization Through Tools," presented by The DoAll Co., was viewed by members of the Long Island ASTE chapter and members of the Long Island subsection of ASME. Traveling with the exhibit is C. G. Schelley, managing director of the Wilkie Foundation. By means of lecture and ten huge display boards the story of man's physical and intellectual development was traced by means of tools he devised and used. Fifty attended the meeting at the Garden City Hotel.

On April 11 Joseph A. Warren, sales engineer for Cincinnati Shaper Co., described the uses of press brakes in industry for Long Island chapter members. The evening was concluded with a ten-minute color film of last year's Long Island chapter picnic.

—William H. Brüning

Fairfield Chapter Adds Twenty-four Members

Twenty-four new members joined the Fairfield County chapter at the April 6 meeting held at the Hitching Post Inn. The technical session featured a talk by George L. Beatty, sales representative of the Process Machinery Div. of Cincinnati Milling & Grinding Machine, Inc.

Mr. Beatty discussed Hydroforming and the Hydrospin Machine, pointing out the low cost of setup, making it advantageous to manufacture small as well as large quantities. The movie "Four Wheel Test Tube" was also shown courtesy of General Motors Corp.

—Henry E. Busby

Arnold Hellewell Speaks at Indianapolis

Further acquainting members and guests of the Indianapolis chapter with automatic screw machines and tooling applications, Arnold Hellewell appeared at the April 7 meeting as guest technical speaker. Ninety-six were on hand at the Sahara Grotto to hear his graphic-verbal presentation. Mr. Hellewell is general machine tool salesman for Brown and Sharpe Mfg. Co.

Another item on the Indianapolis calendar during April was a tour of the local Chevrolet Commercial Body plant. Eighty-seven made the trip.

—Dorman Dickerson

London-St. Thomas Hold Ladies' Night

A family style turkey dinner, beautiful cut flowers and potted plants, entertainment, prizes and dancing to the music of Don Downs orchestra were the elements which contributed to the success of London St. Thomas chapter's third annual ladies' night. Held at the Towne and Country Club on April 15, the event was attended by 180.

—F. W. Lewis

Promotion Announced

Walker A. Messick, a member of the Evansville chapter, has been promoted to manager of manufacturing engineering at Servel, Inc., according to an announcement by John H. Wall, vice president and general manager of the Home Appliance Div. Having joined Servel in 1947 as equipment supervisor in the process engineering department, he has been general supervisor of shop engineering in the company's Wing Div. for the past three years.

Chief Engineer Gives Talk on Surface Grinding

John Harrington, DoAll Company's chief engineer, spoke April 14 at a meeting of Milwaukee ASTE members. His topic was "Modern Surface Grinding and Band Sawing." A color film accompanied the discussion.

Another speaker on the program was John Beck who showed a film on the manufacture, assembly and final test of the jig bore. An attendance of more than 100 members and guests was on hand for the meeting held at the American Serbian Memorial Hall.

—Walter Behrend

New Haven Members Hear E. L. Woods

"The M-1 Rifle and Phases of Its Manufacture" was the technical subject covered at New Haven's April meeting. Speaking to the chapter was E. L. Woods, chief of the technical services branch, Research and Development Division, Springfield Armory. His program, which included films on all phases of operation of the rifle, was introduced by Technical Chairman Dave Mathewson.

Seventy-five members and guests attended the dinner session held at Waverly Inn in Cheshire.

—Silas W. Becroft

Positions Wanted

INSTRUCTOR — mechanical drawing and tool design. Nine years technical school, three years of college teaching, also industrial experience with automated mechanisms. Desire position with institution setting up tool engineering courses. Write to Box 039, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

TOOLMAKER—middle-aged, married, no family, at present living in Weston, Ont., would like opportunity to improve his position. Not limited to present area. Broad knowledge of mechanical field. Jobbing shop experience: cam design and making (six years), electrical and automatic machine setup, layout, production work, inspection. Write to Box 041, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

CHIEF MANUFACTURING ENGINEER—Graduate M. E., knows mass production of small metal parts and assemblies. Good organizer. Cost conscious. Experienced in automation, tool design, methods improvement, cost estimating, designing for economical production. Currently employed as chief engineer. Age 40, married, will relocate. Write to Box 043, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

MILWAUKEE—Leading ASTE chapter activities for this year, seated, are these officers: Robert E. Bodendoerfer, national delegate; Stephen Pohlhammer, chairman; Larry A. Wacker, standing, secretary; Hans G. Frommer, second vice chairman; and Ralph W. Lund, first vice chairman. Treasurer George L. Riordon is not in the photo.—*Walter Behrend*

Thread and Form Rolling Discussed at Hartford

After having dinner at the Hartford City Club, members of the Hartford chapter adjourned to the auditorium of the Hartford Gas Co. to hear a talk on "Thread and Form Rolling." Nearly 125 attended this April meeting, when Clifford T. Appleton, vice president of Reed Rolled Thread Die Co., was the guest speaker. Mr. Appleton, assisted by Earl Walker and John Baskis, explained the rolling process, its economy and versatility. A special guest was Richard A. Smith, a national director of ASTE, who gave a short commentary on the Los Angeles Convention.

Proctor

On March 7 members and their wives enjoyed Hartford's annual ladies' night. Orchids were presented to all the gals at the Indian Hill Country Club. A high point of the evening was the presentation service award to a faithful worker for many years in the chapter, Douglas A. Proctor, former editorial chairman. Mr. Proctor is president and director of Harrington Machinery, Inc.

Also in March the Hartford chapter held a panel discussion on tool steel and high-speed steels, including air hardening steels and methods for improving them. Panelists were W. G. Dahl, district sales manager of West Hartford office of Latrobe Steel Co.; R. P. Kells, chief service engineer for Latrobe; and Gordon Wheeler of the Sentry Co. *—Merle S. Fogg, Jr., and A. Douglas Proctor*

Sitarz and Linsley Speak at Racine Meeting

Two technical lectures were featured at the April 4 meeting of Racine chapter. "Revision in Tap Standards" was discussed by Walter J. Sitarz of Morse Twist Drll & Machne Co. and "The Meaning of the Machine Tool" was covered by H. E. Linsley, associate editor of American Machinist."

In his talk, Mr. Sitaz told the history of the development of tap standards, and distributed booklets showing the new and old standards.

Mr. Linsley's discussion dealt with the development and improvement of machinery and assembly line processes. He also showed a new film on automation at Ford Motor Co.'s Cleveland engine plant. *—Alvin J. Michna*

LANSING—New officers of the chapter are: Arthur Rieser, treasurer; Mitchell Sebo, first vice chairman; Harry Aldrich, second vice chairman; William Janetzke, chairman; and Harvey Robey, secretary.

Broaching is Topic at Syracuse Program

Joseph A. Psenka, field engineer, National Broach and Machine Co., addressed members of the Syracuse chapter at their April technical meeting. "Broaching Principles, Design and Manufacture" was his subject.

Highlighting the meeting was the presentation of two awards. Herbert T. Mozeen received a past national director's award from Hugo Klix, and Lester H. Collins received the service award from Eugene Bloom.

—Paul H. Hansel

Seattle Lecture Covers Automatic Welding

ASTE members attending the March installation meeting heard a discussion on "Tooling for Automatic Welding." Speaking to the group was Y. D. Gilbert, senior tool engineer at Boeing Airplane Co. An interesting display of photographs of tools, equipment and welded assemblies was used to illustrate his talk.

Another feature of the meeting, held at Seattle Town and Country Club, was the swearing in of new chapter officers.

—H. F. Hanson

Electromachining Methods Is Topic at Pittsburgh

C. Paul Porterfield, vice president of Method X Co., was the technical speaker at Pittsburgh's April meeting. About 65 members heard his lecture on electromachining of metals.

Within the past few years, considerable research has been done on this method of machining to find better methods to handle the stubborn problems presented in the processing of sintered carbides and super alloys. An extended question and answer period followed. *—E. L. Caughey*

Montreal Chapter Tours Canadian Vickers Plant

Primarily a shipbuilding concern, the Canadian Vickers Plant in Montreal was toured by 85 members and guests at the April ASTE meeting. The firm also specializes in all types of machining and fabrication of metal. Much interest was shown in the new car ferry which is being fitted out for service this summer between Newfoundland and Nova Scotia.

After the tour, a general discussion period was conducted by W. Fox, director of personnel; S. Fromson, manufacturing superintendent; and Mr. Peck, naval architect.

—A. L. Beausoleil

New Appointments Made by Rockford Firm

Metal Cutting Tools Inc., Rockford, Ill., announces the appointment of Bruce G. Miller as vice president and general manager. Ray E. Ambrose, formerly sales engineer, succeeds Mr. Miller as sales manager.

Standard Data Discussed by Peoria Speakers

Using slides as visual aids, Herbert K. Keever and Norris Perris told Peoria members attending the April meeting the various ways of using standard data for quickly determining the most economical methods of routing and processing. The speakers are partners in the firm of Stevenson, Jordon & Harrison.

They emphasized the fact that standard data is especially beneficial to companies faced with the immediate necessity of changing over in their lines of production.

New members of the chapter were welcomed at the meeting. They include: Albert A. Oliver, Jr., Lowell D. Williams (student members), Edward J. Alexander, Max E. Beck, Thomas G. Aylward, Jay D. Millard, William H. Kilpatrick, Jr., and Ray Shipman.

—W. C. Leveck

Investment Casting Topic at Los Alamos

The monthly technical session of Los Alamos chapter on April 6 featured a presentation on "Investment Casting" by J. P. Price. Mr. Price, a sales engineer with the Western Div. of Arwood Precision Casting, showed films and slides and explained the lost wax process for producing complicated castings.

Another technical highlight was a demonstration of a hydraulic motor by William M. Osborn of Osborn Hy-Trans, Inc. *—Lewis C. Osborn*

Passes Registration Exam

Robert S. Goldberger, president of Walter A. Lausterer, Inc. and a member of the Philadelphia chapter, has become a registered professional engineer in the state of Pennsylvania. He holds memberships in ASME, SAM and ASQC.

Mid-Hudson Chapter Tours IBM Plant

More than 250 members and guests of Mid-Hudson chapter met April 12 at the IBM plant in Poughkeepsie for a tour of the manufacturing facilities and a dinner served in the plant cafeteria.

The group was welcomed by W. J. Mair, vice president and general manager of IBM at Poughkeepsie. A film called "Piercing the Unknown" was shown and discussed by Robert Jacobson, instructor in the customer administrative training program.

—Davis Gale

Industrial Waxes Topic at Chautauqua-Warren

"Introduction Uses of Metalworking Waxes" was the subject of the April 21 technical session held by the Chautauqua-Warren chapter. Guest speaker was William G. Thomas, Buffalo district manager of S. C. Johnson & Son Co. Mr. Thomas showed several movies to illustrate the research, testing manufacture and uses of wax, as well as a film showing the effects of speed and rake angle on chips, tool tip temperature and wax finish.

—Walter N. Carlson

Los Angeles Members Hear W. M. Hawkins, Jr.

Discussing dynamic measurement of vibration, William M. Hawkins, Jr., spoke before members of the Los Angeles chapter on April 14. Mr. Hawkins, of Consolidated Engineering Corp., explained how machine tool and cutter vibration can be dynamically measured to cure troubles.

Paul Slater, new chairman, presented Retiring Chairman Eddie Riddle with a gavel and plaque to commemorate his leadership of the past year.

—John H. Hanson

Paul Slater, chairman; William Hawkins, Jr., speaker; and John Boettgenbach, program chairman; discuss the Los Angeles April program.

TUCSON—Robert H. Kitson, center, of Consolidated Engineering Corp. addressed a joint meeting of Tucson and Phoenix chapters held April 12. He spoke on machine tools and vibration. With him are Harry McClain, left, Tucson chairman, and James Matthew of Tucson's program committee.

—Joseph W. Vincent

SAN FERNANDO VALLEY—A film on Micro Switches was shown April 6 by John Schlichtmann, left, and William Burt of Minneapolis Honeywell Corp. Keith Griffin, right, is chairman of the chapter.—*Sam Schwartz*

Sheffield Tour Draws Record Attendance

All previous attendance records for the Springfield, Ohio, ASTE chapter were broken on April 12 when 160 members and guests turned out for the program presented by Sheffield Corp.

The meeting included dinner served at the Sheffield cafeteria, a technical talk by George C. Brown on ultrasonic machining, and a tour of the company's manufacturing facilities. Mr. Brown, sales manager of the Cavitron Div., explained the process developed by his firm for machining of hard metals and carbides.

—Kenneth W. Keller

Tulsa Chapter Honors Outstanding Members

Highlighting Tulsa's March installation meeting was the presentation of awards to several outstanding members. The special service pin went to William L. Riggs for his work as head of the education committee. Awards for securing new members were given to Clarence E. Gahm, Sam Collier and Forrest Coyle.

Other features of the meeting included dinner and dancing at the Harvard Club. Bobby Hudgen's orchestra furnished the music.

—Forrest Coyle

Tomlinson Promoted

Jamison Steel Corp. has announced the promotion of Tommy E. Tomlinson to sales manager for Southern California. He is a member of San Fernando Valley chapter of ASTE and is currently serving as program committee chairman.

Lansing Chapter Holds Installation Meeting

With the installation of newly elected officers, the awarding of the achievement and past chairman pins, the inauguration of a scholarship program and the presentation of a program on heat treatment of steels, Lansing chapter had a full agenda on March 28.

Under unanimous approval by members, a scholarship program was begun whereby two local high school graduates, aspiring in the field of tool engineering, would receive $100 each. Applicants will be selected by a special scholarship committee. The program is the realization of R. F. Geitzel, immediate past chairman.

Mr. Geitzel, stepping down after two years as chairman and a charter member, received his past chairman's pin during the evening program.

For his excellent work and cooperation in all phases of chapter activity during the past year, Retiring Secretary Glenn L. Crippen was awarded the achievement pin. The evening's program was rounded out with a lecture and slides on the heat treatment of steels by a representative of the Carpenter Tool Steel Co. *—Hal Buehler*

Thread Rolling Discussed by San Antonio Speaker

Harry F. Fussner of National Acme Co. was the program speaker at San Antonio chapter's April 12 meeting. He spoke on thread rolling, stressing the importance of using precision equipment and methods to insure high quality production.

James B. Frix, alternate delegate to the convention, gave a short talk on his visit to the industrial exposition in Los Angeles. Guests at the meeting included A. A. Diener, B. N. Brockman, M. M. Wiseman, J. M. Martin and W. E. Muncy. *—Stanley G. Gower*

New Tap Standards Reviewed at Springfield

Unified threads and tolerances allowed under the Unified Thread System were discussed at the April 5 meeting of Springfield, Ill., members. Program speaker was R. I. Ferguson of Greenfield Tap & Die Corp. He also showed a film on taps and tapping.

Announcement was made that Roger W. Wallace, past chairman of the chapter and former technical superintendent of Sangamo Electric Co., has assumed the new position of assistant to the president of John Oster Co. in Milwaukee, Wis. *—Herman Hahn*

Waindle, Smillie Visit Salt Lake Chapter

Past President Roger F. Waindle and Director Charles M. Smillie were guests of Salt Lake City chapter on March 11. The occasion was a combination ladies' night, dinner dance and installation meeting.

Mr. Waindle addressed the group on happenings at the national level, and gave a brief summary of ASTE's history. Mr. Smillie's talk emphasized the value of being a part of ASTE and the importance of wearing the membership pin.

New chapter officers, who were installed by Mr. Waindle, are: William J. Bullough, chairman; Wes Lane, first vice chairman; Joe Oviatt, second vice chairman; Dan Probert, secretary; and Wendell P. Faxton, treasurer.

—Reid L. Rice

Tour and Talks Make Up Merrimack Valley Program

Held at the Bailey Co. at Amesbury, Mass., Merrimack Valley's April program included discussion of metalworking presses and injection molding presses and an informal tour of plant manufacturing facilities.

Speakers were Dean Cochran, manager, Metalworking Press Div., and Burke Weisend, sales engineer, Machinery Div., Hydraulic Press Mfg. Co. Films accompanied their talks.

—Arthur E. Clement

Santa Clara Valley Visits Ford Plant

A tour of Ford's Mulpitas assembly plant was made in April by 219 members of the Santa Clara Valley chapter. The group spent four hours viewing operations and listening to the discussion presented by J. A. Richardson, production manager with the Ford Div., Ford Motor Co. *—William H. Forbes*

SALT LAKE—William J. Bullough, left, chapter chairman, and other new officers were installed March 11 by Roger F. Waindle, right, past president. National Director C. M. Smillie, second from left, and Harry Todd, past chapter chairman, are also pictured.

Two Speakers Featured at Boston Meeting

Keith D. Millis and Jack Savits of The International Nickel Co., Inc., presented a program on ductile iron for the members of the Boston chapter on April 14. The discussion included development of ductile iron, its properties, casting characteristics, heat-treating methods, wear resistance, heat resistance and machinability. Approximately 125 attended this meeting.

—Evo P. Castelli

University Professor Gives Toledo Program

The importance of speaking ability to the tool engineer was the subject discussed at Toledo chapter's April meeting. Presenting the talk was Murray W. Stahl, assistant professor at the University of Toledo.

The speaker pointed out that everyone is faced with a series of speech situations during every waking moment. The tool engineer's success in communicating his ideas, according to Prof. Stahl, will be largely determined by his speaking ability. *—Harold H. Krueger*

PORTLAND, ME.—Howard Stevens, left, administers the oath of office to: Ross Beaulien, first vice chairman; Herbert Ridlon, second vice chairman; James Comeau, chairman; Henry C. Hagman, secretary; and Stanley Hyde, treasurer.

Andy Rylander Becomes Professional Engineer

One of ASTE'S longtime favorites, Andy Rylander, who is now technical editor of *Western Machinery and Steel World*, has become a registered professional engineer in the state of California. Andy holds membership in many technical and professional organizations throughout the country and was formerly technical editor of THE TOOL ENGINEER. He is a past national director of ASTE.

South Bend Learns about "Operation Pushbutton"

A short talk on automatic machine operation and a film called "Operation Pushbutton" made up the March technical program for South Bend ASTE members. Speaking to the chapter was Hale Cadieux, sales supervisor for The Bellows Co.

Another event at the meeting was the installation of officers for 1955-56. They were sworn in by John Yoder.

—Dave Herring

New Professional Engineer

Leroy W. Janson, chief engineer at Sprague & Henwood, Inc. and a member of the Keystone ASTE chapter, has passed the Pennsylvania state examination to become a registered professional engineer. He is also a member of ASME and the Pennsylvania Society of Professional Engineers.

Contests Sponsored by Portland, Me., Members

Part of the annual apprentice competition held in Augusta, two contests, one in drafting and one in machinist arts, were sponsored April 1 by the Portland, Me., ASTE chapter.

Winner of the drafting contest was James Door while top man in the machinist arts classification was William Edgett.

At the chapter's April technical session, members heard a discussion of "Tooling for Better Internal Grinding." Speaker was Kenneth Aiken, sales manager for the New England district, Bryant Chucking and Grinder Co.

—Henry C. Hagman

Named General Manager

J. H. Currie, first vice chairman of Montreal chapter, has been appointed general manager for the Province of Quebec Division of Barker Industrial Equipment, Ltd.

CANTON—Past Chairman Virgil Shelton, right, administers the oath of office to Canton chapter's 1955-56 officers. They are, from left: J. Miller, alternate delegate; S. Sherry, treasurer; J. Babbo, secretary; J. Nickas, second vice chairman; L. Dickerhoof, first vice chairman; and J. Huet, chairman.

New Committee Chairmen Named by Canton Chapter

Eight committee chairmen appointments were announced at the March 24 meeting of the Canton chapter. The occasion also highlighted installation of newly elected officers.

Heading the eight established committees for the coming year will be: L. Lewers, program; J. Richey, public relations; W. Curtis, education; C. Smith, editorial; H. Fulton, professional engineering; V. Mariol, constitution and by-laws; C. Roudebush, membership; and P. Sanford, standards.

Wives were special guests at the meeting held at the Swiss Country Club and entertainment was provided by the Four Sharps, musically-inclined seventh grade students.

—C. C. Smith

Harry Conn Speaks at Western Michigan

"Production Tooling Problems" were discussed April 11 by Harry Conn, chief engineer at Scully-Jones & Co., at a meeting of Western Michigan ASTE members.

Mr. Conn described a procedure for solving production problems encountered in drilling, tapping, recessing, milling, grinding, gaging and inspecting. Application of his analysis to production problems leads to better designs of tools and more efficient production methods.

In March the chapter heard a discussion on the important role hydraulic presses can play in automation. Program speaker was Melvin G. Sulser, Western Sales manager for The Denison Engineering Co.

—G. A. Lensky and Jim Rost

New Vice Presidents at Gisholt Machine Co.

Two new general officers have been elected by the board of directors of Gisholt Machine Co., Madison, Wis. ASTE member Frederick L. Chapman, formerly of sales, has been elected a vice president and also been made a member of the board to succeed Claude K. Swafford who retired earlier this year. George M. Class, formerly of engineering, was also elected a vice president. Both new officers have been with Gisholt for over 25 years.

ASTE, ISA, ASME Hold Joint Erie Meeting

"Instrumentation Research at the National Bureau of Standards" was the subject at joint meeting of the Erie ASTE, ASME and ISA chapters held on March 22. The speaker was William A. Wildhack, Chief of Office of Basic Instrumentation, National Bureau of Standards.

Chairman Davidson

Speaker Wildhack

A March 8 meeting featured a talk on "Plastics for Plastic Tooling." Guest speaker was J. Tierney of Houghton Laboratories. Installation of officers, and awarding of the outstanding service pin to Dave Schuler, were highpoints of the evening.

—D. J. Beecher

Lehigh Valley Members Hear Jack Kleinoder

Secretary-treasurer of Volkert Stampings, Inc., Jack Kleinoder, was the guest speaker at Lehigh Valley chapter's April 15 meeting, held at Hotel Traylor. Mr. Kleinoder, who is intensely interested in apprenticeship in the fields of tool and die making, preceded his assigned subject with a plea for management and workers to accept the responsibility for training more young men to become skilled toolmakers and die makers.

Mr. Kleinoder then presented the film, "Stampings for Electronics," produced by Volkert Stampings Co. Sequences were taken entirely within the plant and showed precision tooling, design ingenuity, and automatic production equipment.

Guests at the meeting included: Paul White and Robert Millington of Keystone Lamp Mfg. Co.; Leonard Gardo and Rader Tolefson from U. S. Gage Co.; Randy Smith and Paul DeLong from L. F. Grammes Co.; Harold Compton of Western Electric Co.; John Mahalik of General Electric Co.; and Frederick Rimmler of Volkert Stampings, Inc.

Preceding the technical portion of the meeting Werner O. Miller, national delegate, reviewed his experiences at the Los Angeles Convention. Mr. Miller, as retiring chairman, was also given a billfold and pocket knife as an expression of thanks from the chapter for his untiring efforts of the past year.

—Chauncey R. Kay

Twin City Members Tour Tubular Micrometer Co.

A trip to St. James, Minn., for a tour of Tubular Micrometer Co. was on the agenda for 130 Twin City ASTE members attending the April meeting. The group was welcomed by Howard James, president of the company.

Arrangements for the visitation were made by Gerald F. Oppel and his committee. *—R. Roy Wressell*

University of Kansas Members Make Plant Tour

A field trip to Kansas City to tour the Fairbanks Morse Pump Co. was taken March 18 by members of the University of Kansas student chapter. They viewed the machining operations of the impellers, pump bodies, crankshafts of gas engines, and numerous other operations necessary for pump assembly. The chapter also visited the foundry and pattern shop. *—Kenneth Crabtree*

coming ASTE meetings

BOSTON—June 11. Outing.

CHAUTAUQUA-WARREN—June 18. Annual picnic.

COLUMBUS—June 11, Oak Park. Annual stag picnic.

GOLDEN GATE—June 17. Annual ladies' night.

HARTFORD—June 6. Trinity College. Educational Night.

LEHIGH VALLEY—June 17, 6 p.m., Hotel Traylor, Allentown, Pa. Ladies' night dinner dance.

ASTE Industrial Exposition and 24th Annual Meeting will be held March 19 through 23, 1956 at Chicago, Ill. The Exposition will be held at the International Amphitheatre.

LONG ISLAND—June 4, The Chateau, Wyandanch, L. I., N. Y. Annual picnic—all day.

NORTHERN MASSACHUSETTS—June 18. Annual outdoor meeting and field day.

PHILADELPHIA—June 4. Annual picnic.

PORTLAND, ORE.—June 18. Gold stag tournament.

RACINE—June 3, 12 noon, Ligget's Palm Gardens, Browns Lake, Wis. Annual frolic.

ROCHESTER—June 6, 6 p.m., Barnard Exempt Firearms Assoc. "Machine Tools and Vibration" by Eugene J. Moscaret, sales manager, Buffalo office of Consolidated Engineering.

SAGINAW VALLEY—June 18. Annual stag party.

SAN FERNANDO VALLEY—June 1, 7 p.m., Hody's Restaurant. "Machine Tools and Vibration" by representatives of Consolidated Engineering Corp.

SOUTHEASTERN MASSACHUSETTS—June 11, 11 a.m., Gaudette's Pavilion, Acushnet, Mass. Annual outing, clambake and visit to Acushnet Process Co. plant.

SPRINGFIELD, MASS.—June 13. "Thread Rolling."

TOLEDO—June 22, Sunningdale Golf Course. June Frolic. Reservations limited to 200,—$6.50 per member, $7.50 for nonmembers.

TRI-CITIES—June 11, 2 p.m., Little's Grove. Annual Stag.

WINDSOR—June 18, 8 a.m., Lakewood Golf Club. Golf Day.

MADISON—Officers were installed at the ladies' night meeting held at the Club Chanticleer. Seated: Leonard Mueller, first vice chairman; John Piekarski, chairman; Jack Murray, national delegate; and Arnold Griswold, second vice chairman. Standing: Chester Frederick; Arthur Collins, treasurer; Arvil Mergen, secretary; and Fred Kessinick, past chairman and installing officer. The service pin for outstanding work for the chapter was presented to Editorial Chairman Lyding Havey.

HOUSTON—Harry Fussner, sales manager for Threading Div. of The National Acme Co., traced the history and development of taps, dies and thread rolling for 128 members who attended the Houston April meeting.—*George Bo-Linn*

Shell Molding Discussed at Niagara District

With Atlas Steels, Ltd., and Swilson Industries of Welland as hosts for the evening, 60 members of the Niagara District chapter attended the April meeting held at Rose Villa Inn in Welland.

Program speaker was R. S. L. Andrews, Shell Cast Alloys Ltd., Guelph, Ont., who emphasized that with the current trend toward automation, shell molding is becoming increasingly more essential. —*William A. Yaeger*

Installation Night Held in Atlanta

Installation of newly elected officers and ladies' night combined to make Atlanta's annual party a success on March 18. Approximately 50 members and their wives attended the event at the Elks Club. A stimulating and challenging report was made by John F. Morris who represented the chapter in the House of Delegates at the Los Angeles Convention. He returned with a notebook of ideas for better chapter operation. —*Joe L. Morris*

Harry Conn Addresses Muskegon Meeting

ASTE members met April 12 at Muskegon's Pontaluna Inn to head a discussion on production tooling problems by Harry Conn, chief engineer, Scully Jones & Co. Illustrating the talk was a film on "Milling, Boring, Tapping and Gaging."

Another film, produced for the Michigan Department of Conservation, was shown during the coffee program.

—*Paul Thunfors*

St. Louis Program Given by Tony Zamis

Speaking at the April 7 meeting of St. Louis members, Tony Zamis of the Illinois Tool Works discussed problems in the production, inspection and design of gears. Mr. Zaimis is chief engineer of the Tool and Machine Division.

The coffee talk was by Dr. J. W. Hubler, professor of civil engineering at Washington University and president of the Missouri Society of Professional Engineers. *—Wilfred C. Graeler*

Rochester Speaker Talks on Plastic Tooling

At their April 4 technical session held at the Barnard Exempt Club, 145 Rochester members heard a discussion on "Plastic Tooling—Applications and Uses." Speaker was Robert Eaton, sales representative for Stone Bros. Pattern Co.

Mr. Eaton presented slides, samples and illustrations of various applications using a plastic compound to make fixtures for mass production machining. The material and method used are relatively new, and it is said that it is used in the making of working models, small instruments and intricate equipment for various precision manufacturers.

—Floyd Weed

Toronto Installs New Chapter Officers

Headed by Bruce Fairgrieve as chairman, Toronto officers for 1955-56 were installed in March by Eric Crawford. They are: W. H. Weatherhead, first vice chairman; Eric Browne, second vice chairman; Harold Storey, third vice chairman; Willard Smith, secretary; Ed Holden, treasurer; and Cliff Farr, national delegate.

Technical speaker was William Johnson, research engineer for Dominion Oxygen, Ltd., who spoke on flame plating of tool steels with tungsten carbide. *—H. N. Holwell*

J. B. Price Presents Albuquerque Program

Outlining design factors for precision casting, J. B. Price spoke before members of the Albuquerque chapter at the Fez Club on April 5. Sales manager for Arwood Precision Casting Corp., Los Angeles Div., Mr. Price discussed the techniques and results which could be expected in ordinary applications for precision investment casting. National Delegate Ben Russo also recounted some of his experiences at the Los Angeles Convention.

—H. E. Anderson

NIAGARA DISTRICT—C. R. Mitchell, left, presents Editorial Chairman William A. Yaeger with the outstanding award pin.

Tri-Cities Chapter Visits Amana Colonies

One hundred members of the Tri-Cities chapter visited the Amana Colonies on April 23 for a plant tour of Amana Refrigeration Co. Following the tour a steak dinner was served at the Colony Club. The Amana Colonies are made up of seven colonies, covering 26,000 acres. *—Don Shewry*

Trade Fair to Hold Tool Engineers' Day

June 3 has been designated as Tool Engineers' Day at the Canadian International Trade Fair in honor of industry's production experts. Feature event of the day will be a luncheon for industrial executives and tool engineers. Canadian chapters of ASTE are sponsoring the event.

Windsor chapter will be host at the luncheon, to be held on the balcony of the Automotive Building at the CITF Exposition Grounds in Toronto. Frank A. Ritchie is chairman of Tool Engineers' Day events. Committee coordinator is Dave Few. Program chairman is Albert Underwood, Jr.

Featured speaker at the luncheon will be Ralph E. Cross, executive vice president of The Cross Co. of Detroit.

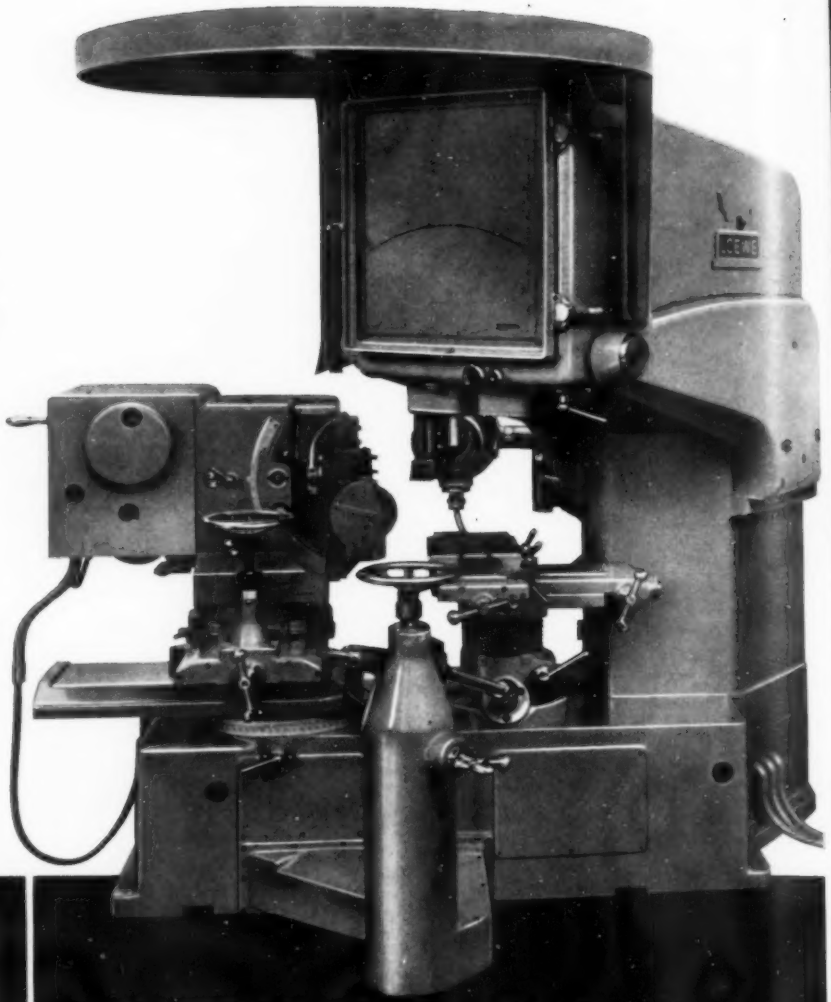
Heads Seneca Falls Company

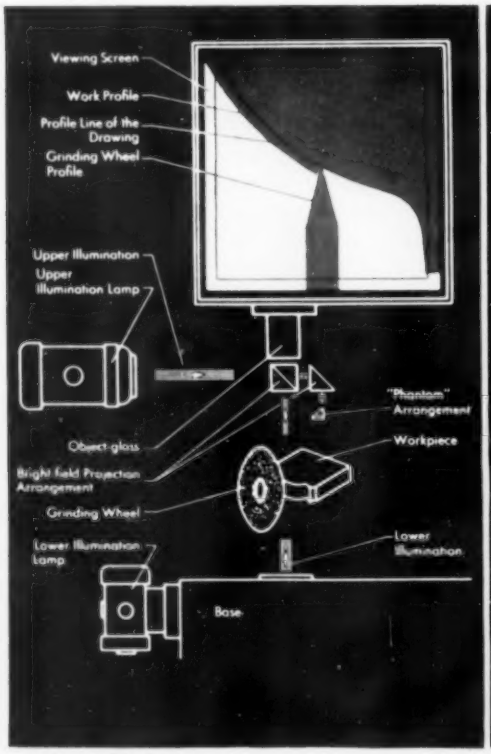
Edwin R. Smith, Jr., member of ASTE, has been elected to the office of executive vice president and general manager of Seneca Falls Machine Co., manufacturers of lathes and automation equipment.

OPTICAL PROFILE GRINDER

MODEL "SP"

FOR PUNCHES · SECTIONAL DIES
GAGES · TEMPLATES
FLAT AND CIRCULAR FORM TOOLS





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- ★ All forms can be ground with equal ease, speed and precision on this most up-to-date grinder
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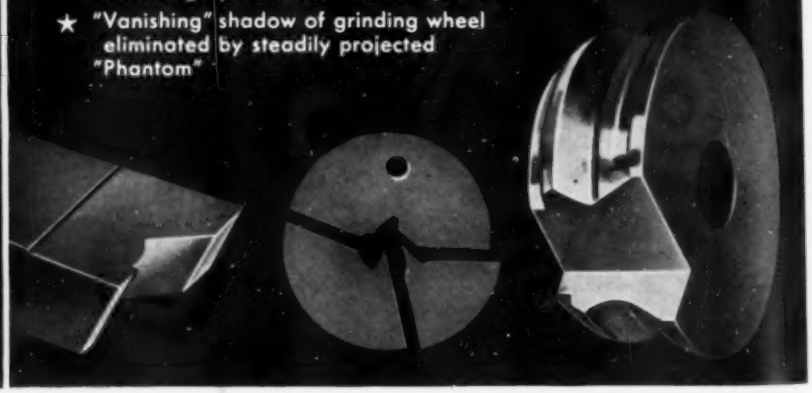

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PROGRESS IN PRODUCTION

GIANT TOOTH-CUTTING MACHINE COMBINES PRECISION AND HIGH SPEEDS

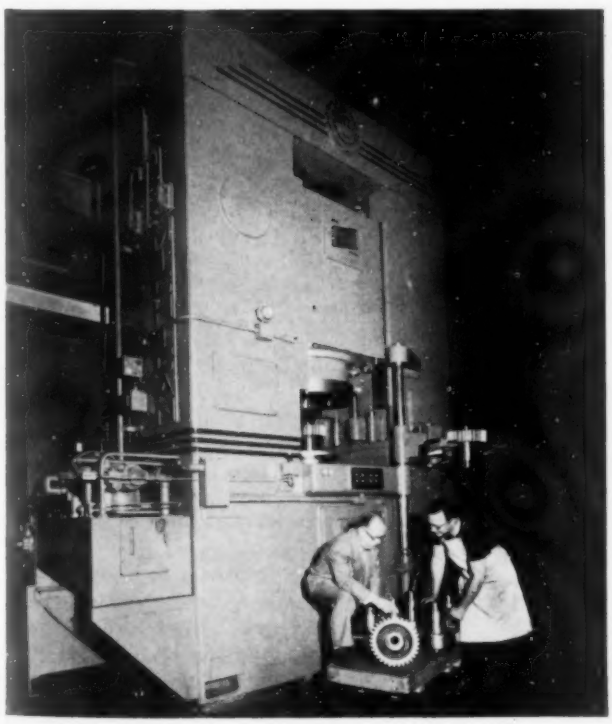
Gears up to 20 inches in diameter and up to 6-inch face width may be cut on the largest high-production shaping machines ever developed for such work. The first of the machines, a 44-ton unit, which stands two stories high, was recently introduced by Michigan Tool Co.

The new machine offers the first means for producing gears of such large size. Previously a 20-inch diameter, 3-D.P., 6-inch width gear would require three hours to produce. With Michigan Tool's new model Shear-Speed Shaper, it can be finished in 13 minutes. Splines, ratchets, clutches, etc. are formed rapidly and efficiently because the machine cuts all teeth of a gear or other external contours simultaneously.

Parts can be produced in wide variety as well, since complete tool changeovers can be handled in about 35 minutes.

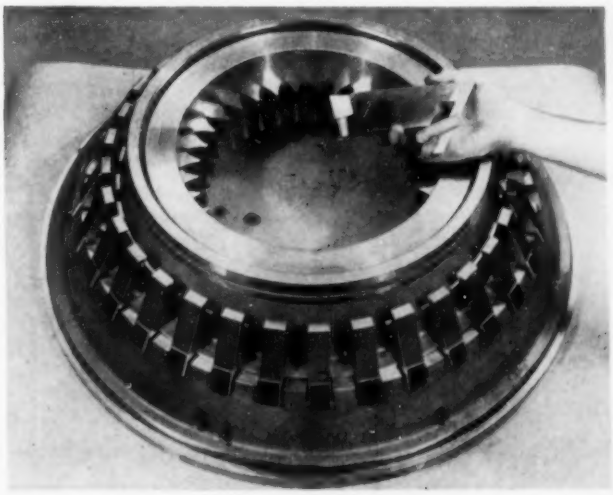
Other refinements of the machine make tooling setups, maintenance and operation a one-man job. Pertinent features in this respect include the automatic hydraulic positioning hoist used to swing the cutting head into position for mounting in the machine, or to load and unload the very heavy part blanks; the convenient grouping of accessibility of various maintenance components; and the convenient location of hydraulic, electrical and drive parts.

The entire machining cycle, including hydraulic or pneumatic part clamping and the removal of the large quantity of chips generated during the operation, is automatic.



Left: Overall view of Michigan Tool's new gear shaper for producing up to 20-inch diameter gears at high production speeds. Note the hydraulically lifted, manually operated work loader located at the front of the machine.

Below. Close view of cutting head for the gear shaper used to produce a 33-tooth gear 12½ inches in diameter. All tools are precision ground as a set and are form-relieved to permit resharpening without disturbing the tool form.



WELDING INNOVATION FOR CARBON STEELS

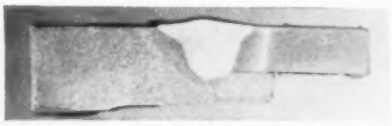
Low cost welding that permits the use of automatic equipment for mild and medium carbon steels is being done through a process developed by the A. O. Smith Corp. The process, called C-Omatic, is similar in operation to the inert-gas, metal-arc methods known as Sigma or Aircomatic welding; however, the gas used for shielding the arc in this case is carbon dioxide. Using standard size cylinders, cost of carbon dioxide is approximately 0.01 per cu ft as compared with 0.06 per cu ft for helium and 0.08 to 0.09 per cu ft for argon.

During operation with the C-Omatic welding, the arc is clearly visible which enables the welder to locate the arc properly in the welding groove and to observe the weld metal as it is deposited. Because of this feature there is no need for flux and the attendant clean-up time that is required.

Welds made with carbon dioxide gas have a wide and well-rounded bead penetration. This shape of bead penetration is considered advantageous by the researchers who developed the method, because it affords complete fusion and provides better liberation of gases from the molten puddle.

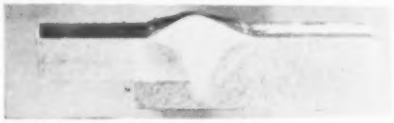
The welding head used is a simple strong unit designed for fast, efficient operation. Filler wire is fed to the head by rollers. The wide variance in wire speeds permits application to submerged arc welding simply through substitution of a submerged arc nozzle and minor electrical connections.

Right. An operator welds a metal part by the gas-shielded metal arc process using carbon dioxide for shielding. Here work is remotely controlled.



Above. Cross section of a weld made with CO_2 gas for shielding shows characteristics of the resulting weldment.

Below. Weld in this sample was made using argon gas for shielding.

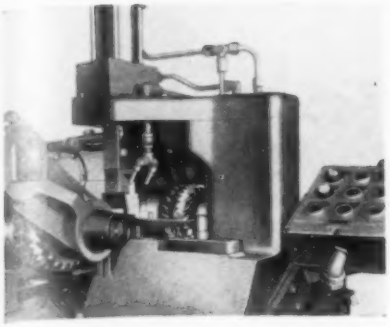


SPEED AND ECONOMY FROM DUAL OPERATION

Simultaneous cutting and milling is accomplished on a single spindle of a single machine to bring about considerable savings to producers of connecting rods.

To be economically produced, connecting rods are forged with the cap and shank in one piece. But then, those pieces must eventually be cut apart. On the recently introduced special unit designed by Motch & Merryweather Machinery Co., a circular saw cuts the cap from the connecting rod at the crankshaft end, while simultaneously it finish mills the top and bottom bolt seats. The single arbor on each head has a Triple-Chip circular saw blade between straddle milling cutters, making this simultaneous cutting and milling possible.

The machine on which the work is accomplished, consists of right and left-



Closeup shows relationship of milling cutters and saw blade to the hydraulically held workpiece.

hand M & M B-7½ traveling milling heads mounted on hardened and ground steel ways. Each head has sturdy arbor supports for the saw blade and straddle milling cutters. The heads approach simultaneously and the circle formed by the crank end of the connecting rod is cut in half and milled from two sides at the same time.

DESIGN CONTROL SYSTEM

Research and development programs encompassing the problem of more reliability for automatic control systems for machine tools have been carried on at Westinghouse Electric Corp. Now results of those projects, in the form of the Cypak Systems, have been revealed.

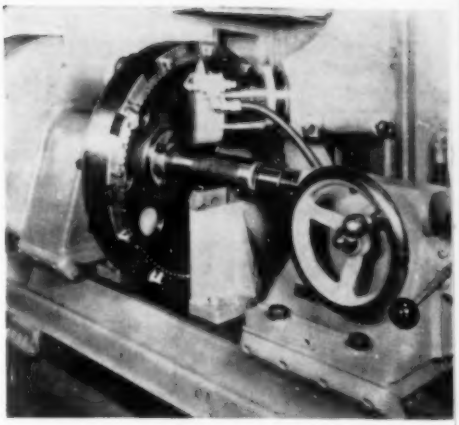
The system, which is not a one-for-one unit substitution for relays now utilized in machine control setups, but rather a design substitution, is a static switching circuit for industrial control. Essentially, it is a relay system without moving parts — a simplified, unified package. Primarily, the system lacks the complexity that is presently a common cause for machine down time for maintenance.

According to the Westinghouse engineers, the Cypak systems will be able to perform any function now performed by relay systems in machine tool control. However, they will do it without benefit of contacts or other parts that are subject to wear or environment.

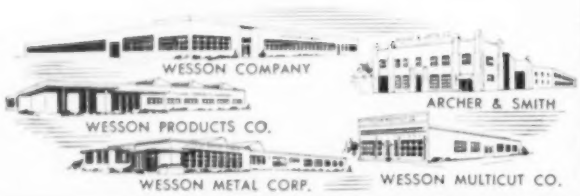
ADAPTATION FOR GRINDING INTERNAL HELICAL TEETH

Internal helical teeth on a ring gear 18 inches in diameter and only ½-inch thick are ground on the special gear grinder developed by National Broach & Machine Co. by modifying a Model SGF 18-inch external helical gear tooth grinder to meet special requirements. To grind the internal gear teeth with a grinding wheel spindle designed for external helical gears, the wheel spindle is swung to an angular setting corresponding to the helix angle of the internal helical gear. Top surface of the wheel contacts the work. Limitation of the table travel prevents contact of the gear with the motorized grinding wheel spindle. A special inverted grinding wheel dresser attachment is mounted on the machine table to dress the top surface of the grinding wheel. Templates are provided, from which the wheel dresser dresses each side of the wheel individually.

When the gear is positioned for grinding, in its special heavy duty arrangement, the wheel is dressed and the internal gear teeth are ground one space at a time and indexed to the next tooth space. A helical guide bar rotates the gear in correct relation to the table reciprocation movement during the grinding of each tooth space.



A gear is mounted in the arbor assembly in grinding position. The unit grinds teeth of an internal helical gear about 18 in. in diameter and ½ in. in thickness.



carbide NEWS

New Wessonmetal "26" Boosts Tool Life 40%

Optimum performance of "nearly universal" grade extends over range of 100 to 400 sfm

Gains in tool life ranging up to 40% over other steel cutting grades are reported for Wesson Metal Corporation's new Grade 26. The new steel cutting carbide has consistently outperformed all other steel cutting grades in 95% of all machining operations on which it has been applied.

Indications now are that the new Grade will produce significant increases in tool life over approximately 80% of the entire steel machining range. While created primarily to handle all types of steel rough and semi-finish machining—light, medium and heavy duty—it also is proving highly effective on some finishing operations.

What is more, the new Wessonmetal grade is not limited to a narrow range of cutting speeds. Optimum performance for Grade 26 extends over a range of 100 to about 400 sfm, covering 95% of steel machining operations encountered in industry today.

Since Grade 26 is the closest approach to a "universal" carbide for steel cutting yet produced, it reduces the number of grades required for steel cutting operations by as many as four grades. Problems of grade selection are greatly simplified, therefore, by the new Wessonmetal grade.

Much of Grade 26's outstanding performance is due to its superior cutting edge strength. Particularly important at the elevated temperatures generated at high cutting speeds, are the carbide's inherently high red hardness combined with high thermal conductivity.

Grade 26 is now in full production at Wesson Metal Corporation's new metals plant in Lexington, Ky.

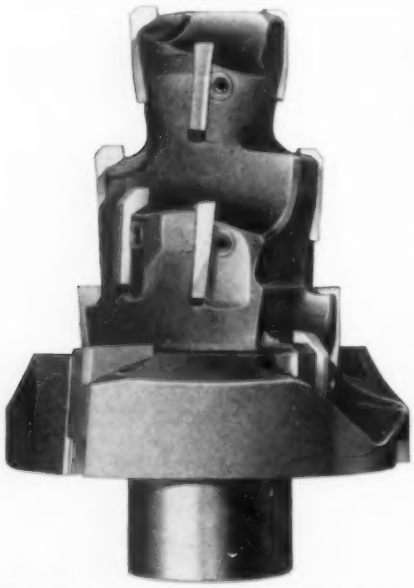
Tool life took a big jump on this severe interrupted cut on a forged steel tractor brake band anchor. Cutting speed ranges from 280 sfm down to zero. Feed is .027", depth of cut is 1/8".

Multi-Diameter Cutters Slash Tool and Machining Costs

Special eight-operation cutters designed by Wesson Company engineers permit a major builder of commercial air conditioning units to achieve a sizable reduction in the cost of machining compressors.

Solid Wessonmetal Grade GS blades are used on the cutters to produce 3600 cylinders per grind, compared with only 250 cylinders per grind previously. Grinding takes one-third as long as on tools previously used.

Although solid carbide blades are used on this operation, these special multi-diameter cutters are typical of the many other special Wesson designs incorporating standard blades which provide interchangeability of solid carbide, carbide tipped or HSS blades without modifying blade slots.



A total of eight chamfering, semifinishing, finish boring and facing operations are performed at each of five stations with these cutters on a W. F. & John Barnes boring machine.

tools Wesson carbide Wessonmetal

For answers to your machining problems write:

WESSON COMPANY, DEPT. AD, 1220 Woodward Heights Blvd., Detroit 20, Michigan

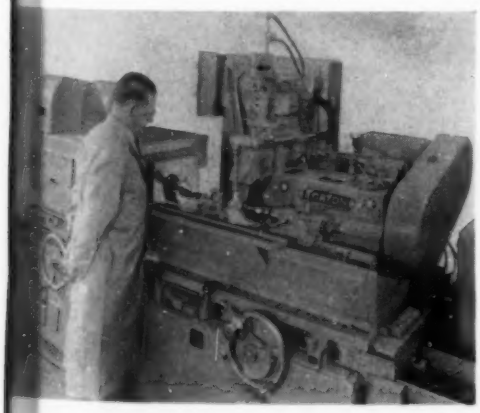
TOOLS of today

Cam Grinder

The precision No. 3 Cam-O-Matic automatic cam grinder has been developed by Norton Co. to do faster grinding of automotive type camshafts with a fine finish. Improvements of design over former models are the simpler, sturdier construction details, plus a positive work drive which contributes to better cam form and finish. Use of a Gilmer timing belt produces smooth work rotation without slippage while requiring less power.

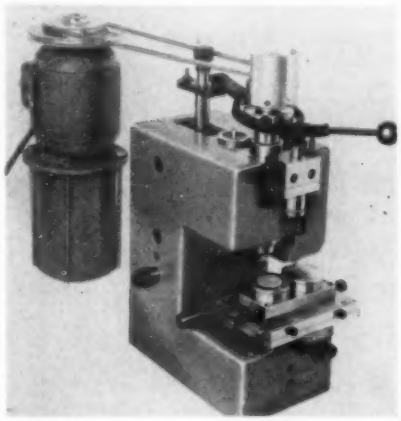
There are two automatically controlled workspeeds: the higher speed is adjusted for optimum rate of stock removal; the slow speed calculated for best accuracy of contour and fine finish. Change from the fast to the slow speed is automatic and its timing can be easily adjusted.

Other features of the model are the improved grinding action, automatic wheel guard truing, automatic compensation for wheel wear, and include simplified electric and hydraulic controls for earier maintenance. **T-6-1491**



Drilling and Boring Unit With Automatic Feed

Automatic feed and copying mechanisms have been incorporated into the simple basic design of the Swiss-built Posalux PEP 101 for drilling and boring. Feed is electropneumatically con-



trolled and has an accelerator for the unproductive motion of the spindle. Due to the pneumatic feed mechanism, the drilling operation is very sensitive.

Deep holes in steel and other hard materials may be drilled without the use of drill jigs with hardened bushings. Drill wear is minimized and drill breakage prevented because of this.

Speeds up to 15,000 rpm with capacity of 0.004 to 0.15 inch make the PEP 101 a useful machine for all sensitive drilling operations and a suitable replacement for a jig borer on medium production quantities. Complete details are available from Carl Hirschmann Co., Inc., 30 Park Ave., Manhasset, N. Y. **T-6-1492**

Thread Rolling Unit

Landis Machine Co., Waynesboro, Pa., has introduced a thread-rolling machine that produces quality threads by cold forming. The unit, called Lanhyrol, is designed to produce threads by four different methods of rolling to meet requirements demanded by conditions of workpiece and design. It produces, with suitable rolls, left or right-hand threads of all types except square threads or threads of high taper, 3/16 to 3-in. diameter. Threads to Class 2 and 3 tolerances are possible when high-production continuous rolling is used, while tolerances up through Class 4 can be maintained with infeed, through-feed or reciprocal rolling.

Although maximum pitch limitations vary, depending on characteristics of the workpiece, under normal conditions the unit produces UN form threads, ranging in pitch from 5 to 32 tpi. Acme threads of 6 tpi or more, and worm threads equivalent to 8 diametral pitch and finer. With the use of auxiliary equipment, threads may be rolled on hollow, extra long or odd-shaped parts.

When thread length requirements do

not exceed 5⅞ in., infeed or plunge rolling is generally used; for producing threads longer than 5⅞ in., through-feed rolling is necessary. With continuous rolling, which provides the highest rates of production, 120 threaded units per minute may be provided. **T-1-1501**

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

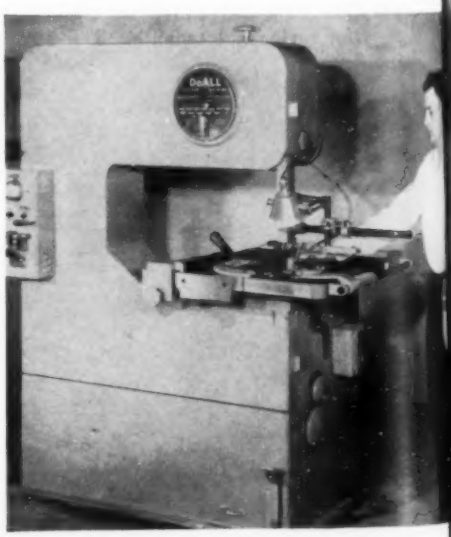
Deep Throat Contour Saw

A companion model to its 16-inch machine has been introduced by The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill., with the development of this 30-inch contour saw for job shops requiring a versatile, low-cost, deep throat machine.

The new saws are engineered and powered for straight or curved metal sawing operations. They are easily arranged for band filing, metal polishing, finishing and slicing of other materials simply by applying the proper accessories built for the machine. In addition, they can be used to finish grind carbide tools.

Twenty different attachments which can be mounted quickly and easily, are available for versatility of standard and specialized operations.

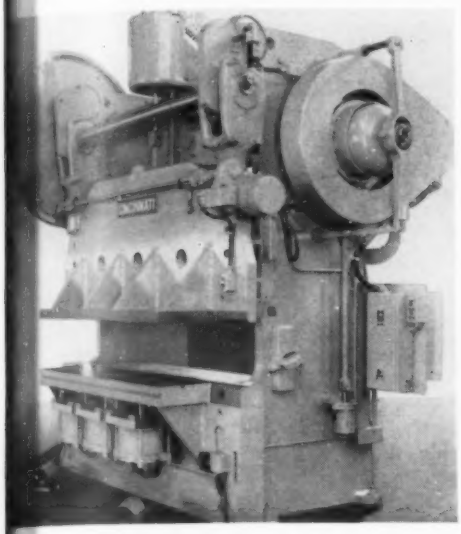
Worktable is 24 by 24 inches; table tilts 45 degrees to right and 10 degrees to left; saw blade welder handles blades up to ½-inch width for welding and annealing. Although equipped with standard DoAll saw guides, these can be interchanged with six other types for specialized sawing, including 90-degree angle guides for cutting off long pieces. Lower guide can be located above the table surface for trimming operations. **T-6-1502**



Press Brake

An all-steel press brake which can be used for shallow draw work as well as various types of press operation, is announced by The Cincinnati Shaper Co., Hopple, Garrard & Elam Sts., Cincinnati 25, O.

It has a 36-inch permanently wide bed and ram with a shut height of 15 inches and 8 feet over-all die surface,



and six 12-inch air cushions mounted on the underside of the bed, both front and back.

The approximately 17-ton unit is equipped with an air electric clutch with automatic stop and nonrepeat. Two foot pedals are arranged to operate separately or as one unit to insure safety, especially in multiple press operations.

Additional features of the press brake include a special two-speed transmission operating at 13 and 30 strokes per minute, an air counterbalance, and a 5-inch stroke. **T-6-1511**

Vibrationless Boring Bars

Chatter-resistant boring bars produced by the Fry Tool Mfg. Co., Eaton, Ohio are being marketed exclusively by Easco Products, Ypsilanti, Mich.

The bars, which may be used at higher speeds for both light and heavy cuts, are made of special steel alloy to give them greater strength and rigidity. They are machined to proper shape, externally and internally, and heat treated. To provide the vibrationless, chatterless element, the hollowed bars are packed with lead pellets in heavy grease.

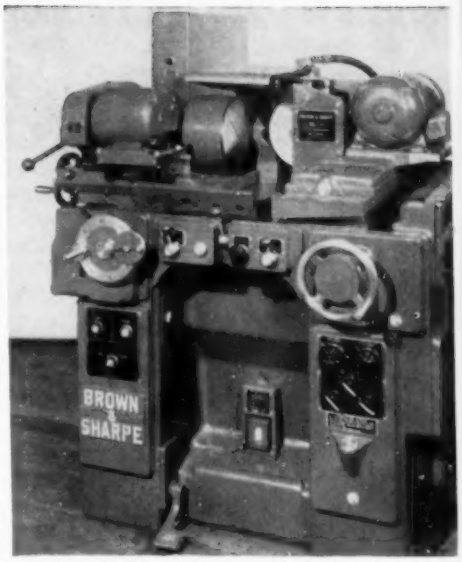
The Fry bars are available in five diameters from 1 to 2½ in., in tool bit sizes from 5/16 to 5/8 in. Lengths range from 14 to 26 in. **T-6-1512**

Face Grinding Machine

Brown & Sharpe Mfg. Co., Providence 1, R. I., has developed a face grinding machine which has a work spindle in a horizontal plane, permitting wide flexibility of work-holding devices. The work rotating in a vertical plane permits easy cleaning of the work-holding surface, effective coolant application and high surface quality of the work being ground.

Grinding with the periphery of the wheel, this machine produces accurate, flat surfaces on work up to 10-inch diameter and up to 3-inches thick, on a permanent magnet chuck. Accurate concave or convex surfaces up to 10 deg are also easily ground. Wheel truing is by the set-diamond method.

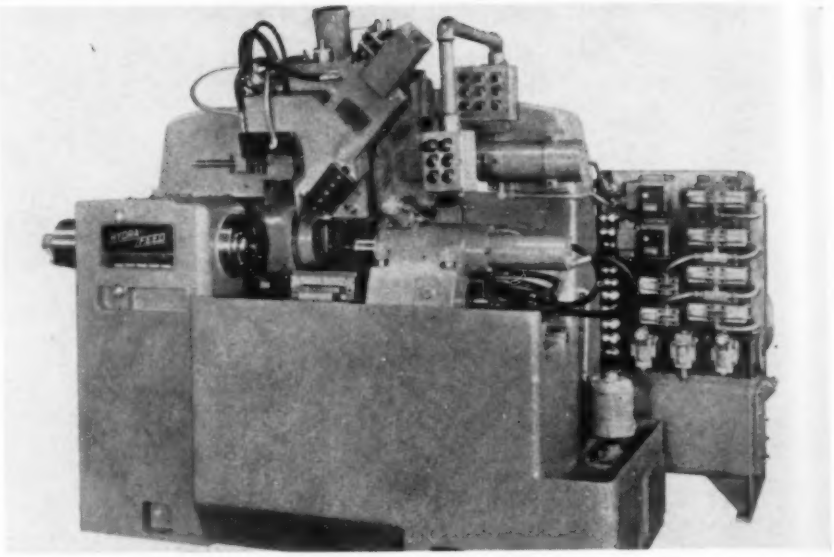
The wheel slide grinding and truing speed and the work feed rate are



readily selected and set, with graduated dial indicating rate in use at all times. Automatic work feed can be set for the inside and outside reversal or the inside reversal only. Dwells from 0 to 2½ seconds are independently variable at the inside or outside or both.

A positive stop provides for both manual and power feed of the work head. Choice of manual or semiautomatic control, accurate wheel spindle slide reversal, sealed lubricated spindles and automatic lubrication are other features.

The grinder offers simplicity of setup and ease of operation. Accuracy of sizing is attained through the work feed mechanism. **T-6-1521**



Copying Lathe

A tracer lathe made by Hydra-Feed Machine Tool Corp., features sturdiness, versatility and high production, which not only permits the turning of complex shapes while reducing the chance for human error, but also provides strength and power to take sizeable cuts.

Location of the tracer slide on the top carriage of the Hydra-Feed HD-8 tracer lathe lessens the possibility of chips, dirt, etc., getting onto the slide and interfering with efficient operation.

Either a constant or variable speed drive for the spindle can be supplied. An auxiliary rear carriage is available for facing, grooving, chamfering or any other type of cut that can be handled by a straight plung operation.

Either flat or round templates of any shape can be positioned quickly and positively on the unit.

Because the stylus exerts only light pressure, the template can be made of relatively soft material. In some machining operations, the fine finish possible with the tracer avoids need for hand polishing and grinding. Changeover from one part to another with a different contour is extremely rapid and can normally be completed in less than 10 minutes.

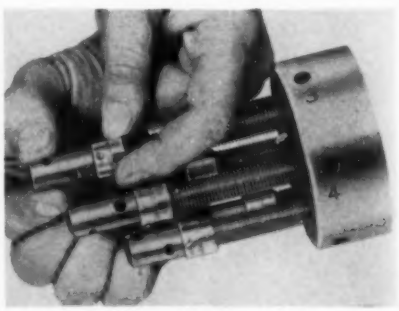
Details on the lathe may be obtained from the manufacturer, 730 W. Eight Mile Rd., Ferndale, Mich. **T-6-1522**

Micrometer Stop

A micrometer stop that does not utilize indicators, feelers, gages, etc., and which can be applied to any screw that needs micrometer adjustment, has been introduced by M. L. Parker Mfg. Co.

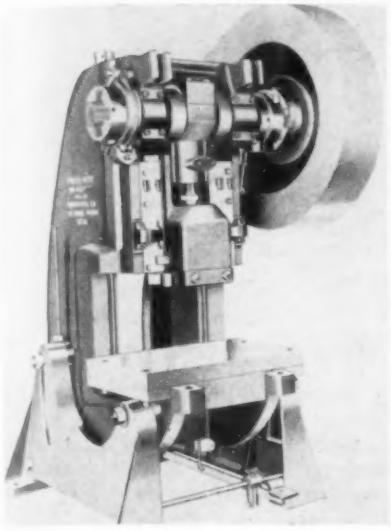
The unit adjusts to 0.001 inch and can be applied to any stop screw, such as on ram or saddle type turret lathes, mill stops and production equipment. Available for any pitch or diameter needed, it fits on the present stop screw and is fastened by a setscrew.

The micrometer stop is distributed by Dexco Corp., 19959 James Couzens Hwy., Detroit 35, Mich. **T-6-1523**



Power Press

In addition to its Press-Rite line has been announced by Sales Service Machine Tool Co. with the introduction of the No. 45. The new 45-ton press features a heavy-duty frame with built-in high tensile steel tie rods that result in reduced deflection and consequently increased die life. Further features are



the greater shut height and easy accessibility from front or rear of the press for adjustments; this permits faster setups and use of larger dies. The press has a standard stroke of 3 in., a 4-in. diameter crankshaft at main bearings and a maximum stroke of 6 in., with 2-in. adjustment of the slide. The bolster area is 20 x 30 in.

With the four-point mechanical clutch available with the press, standard speed is 90 strokes per minute; when equipped with the air friction drum type clutch, higher speeds are possible.

Overall height is 69½ in. from floor to center of the crankshaft. Required floor space is 50 x 45 in. **T-6-1531**

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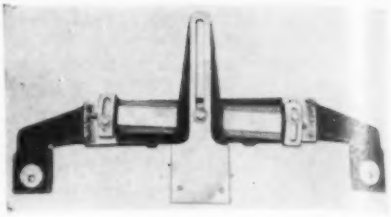
Taper Attachments

Heavy-duty taper attachments that require only single over-arm connection to lathe cross slides, with no other holes to drill, are announced by the Master-Taper Co.

Dovetailing slides or ways are incorporated in the attachments to assure both accuracy and a simplified method of clamping to any lathe to allow set-up in minutes. Only two dimensions need be given for factory fitting: length



of the carriage and distance across the top of the 45-deg V-way of the lathe to be fitted.

Shipping weight of these new heavy-duty attachments is about 80 lb. Lighter duty attachments are also available for smaller lathes with a 10-inch swing.

Full information and specifications concerning these developments can be obtained by writing the manufacturer, Dept. TE, 4543 N. Clark St., Chicago 40, Ill. **T-6-1541**

Multipurpose Carbide

Kennametal Inc., Latrobe, Pa., has announced a multipurpose sintered carbide steel-cutting material designed for high productivity on both high and low-speed machines through a wide range of applications.

The new material, called K21, has a Rockwell A hardness of 91.5 plus high transverse rupture strength. Specifically it was designed for general cutting, heavy roughing and finishing of steel products. It offers high edge-strength, fine wear qualities and resistance to cratering. Its qualities make it suitable for plunge and interrupted cutting of castings which have sand inclusions and hard spots. In addition, the substance has demonstrated its effectiveness on lighter cuts.

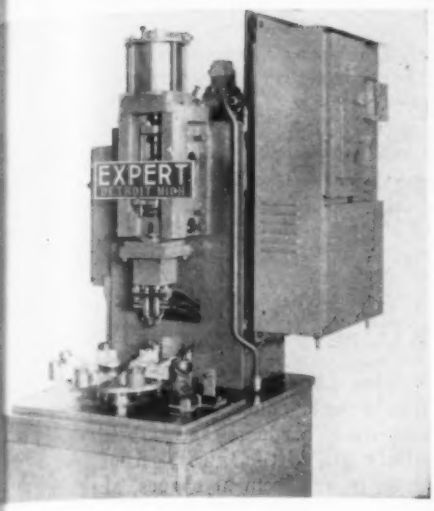
K21 is stocked in blanks, tools and inserts. **T-6-1542**

Index Unit for Welding

An eight-station index machine that produces up to 720 welded assemblies per hour is available from Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich. This machine, of simple, compact design that features an all-mechanical drive, is suitable for a wide variety of spot, projection and arc welding production operations.

Basically the eight-station welder consists of a welded steel frame, a standard or special welding head, an electrical control cabinet, 24-inch index table, and a ½ hp, motor-driven mechanical drive enclosed in the base of the machine. Manual loading, automatic index cycle and automatic part ejection are provided for the welder operation.

The index table is driven by a simplified motorized cylindrical cam arrangement, which makes possible one-



second indexes.

A flexible fixture mounting design on the machine assures that no loads imposed by gun operation are transferred to the index table.

The machine can be adapted for a variety of welding operations requiring six indexes and up by changing the cam and follower plate.

The welder illustrated is spot welding stamped steel automotive engine oil breather assemblies at a rate of 720 pieces per hour. In this operation a 2½-second welding cycle and 2-second index time are provided. **T-6-1551**

Piloting Tool for Roughness Measuring

Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich., announces the Type RE Rotary Pilotor for taking Profilometer roughness measurements around surfaces of rotation on small parts on a production basis. Surfaces of 1/32 to 2-inch radius or more may be measured, and tracers can be furnished to reach surfaces in parts of almost any shape.

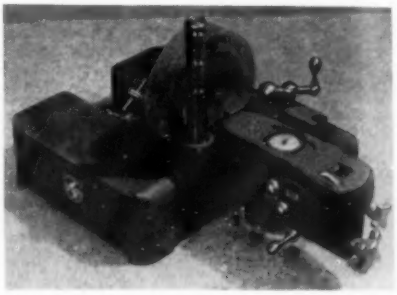
An adapter locates the center of ro-

tation of the work surface on the axis of the spindle; and the work surface moves past the tracer point of a stationary tracer at a speed of 0.1 inch per second. Change pulleys can be furnished to provide the same tracing speed for surfaces of different radius. Reciprocating rotation may be selected through any desired arc from 10 to 350 deg. **T-6-1561**

Hardness Measuring Unit

Taber Instrument Corp. has developed a tester called the Dyhedron, for measuring hardness and lubricity of metals, glazed tile, glass, carbon, graphite, precast cement shapes, abrasive wheels and hones and like materials.

This dynamic hardness tester utilizes a precisely shaped octahedral diamond to work itself into the test material with a rotary oscillating motion. Its scope of testing ranges from soft plastic



to tough steel, both solids and bonded granular materials. Depth of penetration is read from a precision dial indicator and the 360-deg oscillations of the diamond are read from the rotary counter.

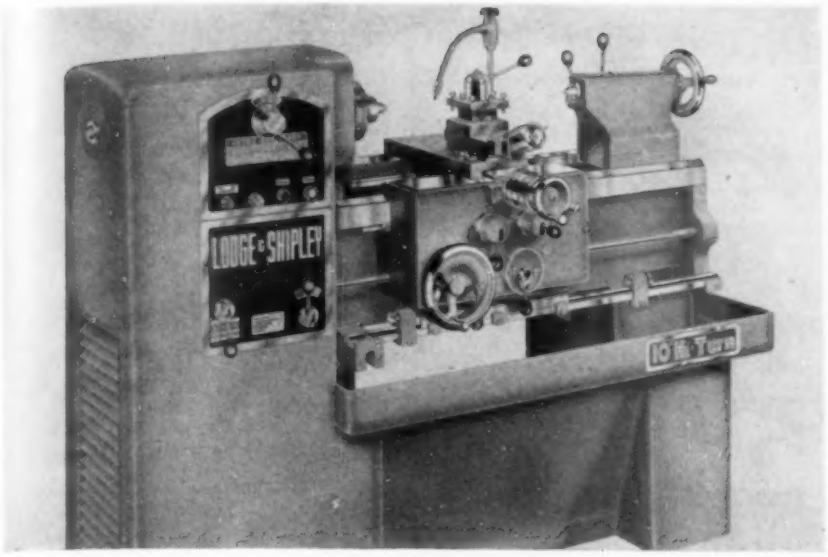
Literature describing the applications and method of operation of the Dyhedron is available from Taber Instrument Corp., Section T, 111 Goundry St., N. Tonawanda, N. Y. **T-6-1562**

Low-Cost Lathe

A 10-inch Hi-Turn lathe has been designed by The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio, specifically for production operations by providing speeds to 3000 rpm in a heavy-duty geared head with a full 5 hp at a comparatively low price.

The new unit, which incorporates several design features, has done away with the leadscrew so rarely required for production operations. A feed rod is used to provide turning, boring and facing operations.

Among features of the lathe is the headstock with 9 spindle speeds ranging from 3000 down to 202 rpm in the



high range. The lever-operated totally enclosed quick change gearbox provides 9 feeds ranging from 0.0015 to 0.024 inch per revolution. All nine feeds and speeds are color coded; feed selection is also color coded.

A built-in 4-way tool block has provision for rear tool block and multiple tool operation. Dial features are dual direct-reading micrometer cross feed dials reading to 0.001 inch on diameter, and a micrometer dial indicates carriage travel in 0.005-inch graduations.

T-6-1571

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Metallic Putty

An aluminum putty, which shrinks less than 0.2 percent while hardening, and will not crack in thick applications, is available from Smooth-On Mfg. Co., Jersey City, N. J. It may be used for building up metal surfaces or for caulking seams and holes in metal and wood surfaces. The substance, Metalset A201, is easy to mix with its curing agent and may be applied with simple hand tools to vertical or overhead surfaces.

It hardens to a metallic density at room temperature or additional external heat may be used to expedite curing. Its heat ceiling is 300 F. The product can be machined by any conventional method, and can be tapped or drilled. It is not affected by water and resists acids and alkalis. Adhesion is good.

In this epoxy resin compounded with aluminum and other ingredients to form a paste, filler materials are completely suspended. There is no solvent to evaporate.

T-6-1572

Tap Analyzer

Stocker & Yale, Inc., Marblehead, Mass., has developed a tap analyzer that provides precise measurement of the flute characteristics that govern cutting efficiency and accuracy of a tap. Actually it is an accurate measuring microscope which provides means for holding a tap firmly in definite relationship to the various calibrated motions of the instrument. The tool features a monocular microscope which may be brought to focus on any portion of a chucked tap from any angle.

Accurately calibrated dials on the collet head and on the microscope assembly provide scales by which measurements can be made, including these aspects: Hook or rake angles in flute or in spiral point can be checked to tolerances of 1 deg; indexing of cutting

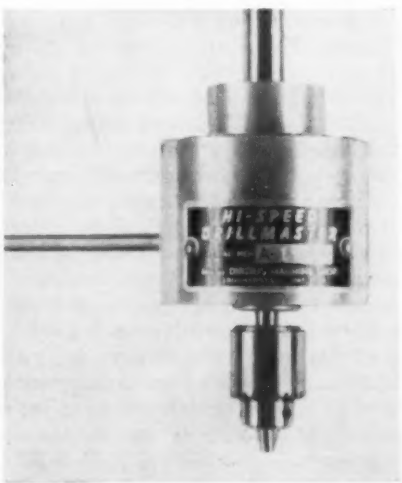
edges, to 30 min of arc; concentricity of threads or web, to tolerance of 0.0005 in.; spiral point angle to ½ deg, or chamfer angle to 1 deg. The tool measures chamfer or thread relief to 0.0002 in.; major and minor diameters to 0.0001 in., and makes a comparison of surface finish to a tolerance of 5 micro-inches. **T-6-1581**

Drill Converter

Dirzius Machine Shop, 1423-25 S. 52nd Ave., Cicero 50, Ill., has developed a low-cost unit called the Hi-Speed Drillmaster, a speed converter which fits into the chuck of any standard bench drill press. It houses a precision built gear train which has a speed ratio of four to one, and when applied to any drill press, multiplies the speed of that press four times. As an example, when Drillmaster is used on a 5000 rpm drill press its rated top speed will be 20,000 rpm, a useful speed for drilling such materials as brass, aluminum, plastics and cast iron.

The unit's concentricity for indicator readings holds to 0.0005 inch.

The spindle shank, which fits any ½-inch chuck, holds drills from 5/32 to #80. **T-6-1582**

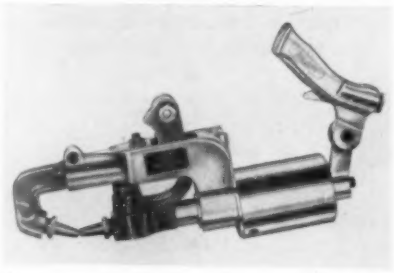


Resistance Welding Gun

A line of portable resistance welding gun units, developed by the Craft Welding Equipment Co., 738 W. Seven Mile Rd., Detroit 3, Mich., features complete interchangeability of parts between the various gun types.

These guns incorporate an extra long bushing, exceeding length of stroke, which prevents bearing failure due to flash carry-back. Interchangeability of jaw extensions on the Craft units, minimizes the number of gun types necessary to any welding operation.

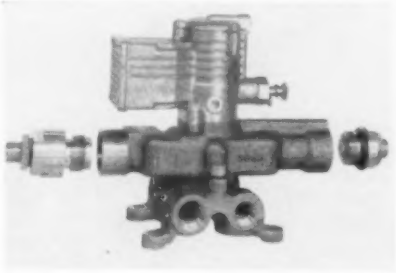
The guns are engineered for quick, simple maintenance by the reduction of components. In addition, simplification in design and precision construction also has avoided need for hidden bolts and nuts. Every operating component in all Craft gun models is of standard design meeting the prevailing JIC and RWMA classifications. All parts, electrodes, adapters in these units can be changed without the necessity of special tools. **T-6-1591**



Speed Control Valves

Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, has designed a simple arrangement to add the speed control feature to their Speed King solenoid pilot-operated valves.

Restriction of flow through the main control, or Speed King valve, is accomplished without the need of separate flow control valves.



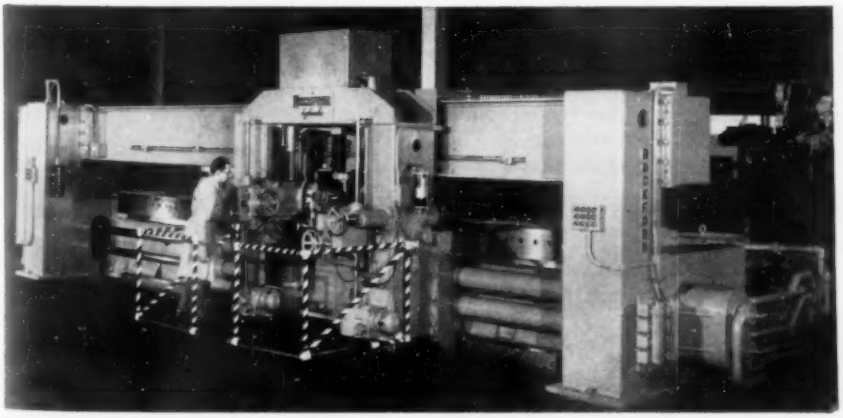
This control through the main control valve, is done by the addition of adjusting screws in the end caps which will restrict the stroke of the main stem of the valve and thus restrict the flow of cylinder exhaust air through the valve.

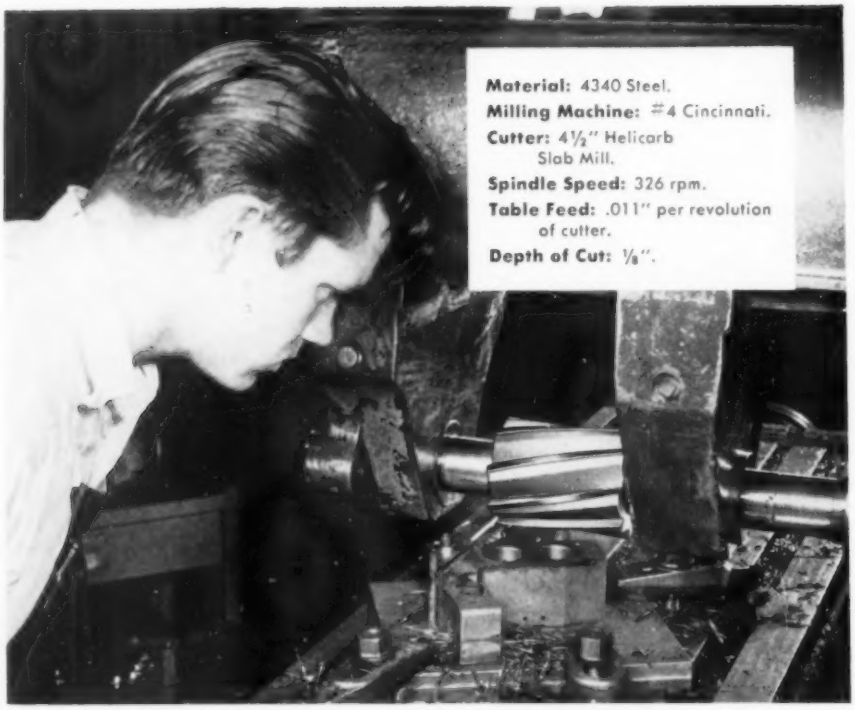
Speed control also will be available as a kit to convert those valves already in service to speed control. Valves with built-in speed control and conversion kits are now available for 4-way foot mounted and sub-base mounted, single and double solenoid, in sizes ¼, ⅜, ½, ¾ and 1 inch. **T-6-1592**

Plate Edge Planer

Rockford Machine Tool Co. has developed a 14-ft. stroke hydraulic plate edge planer, with a working capacity 14 ft. wide x 7 inches thick.

The machine saddle, mounted on two vertical ways, reciprocates from 10 to 200 fpm with infinitely adjustable cutting speeds. The saddle carries a right and left-hand side head rail on which are mounted the two side heads that carry the cutting tools. While the entire saddle assembly, plus the two hydraulic cylinders, moves back and forth, the cylinder rods remain stationary with the bed and columns. Most saddle and head movements are controlled by the operator from either the stationary pendant or from a movable pendant on the platform of the saddle. Either conventional type planer tools or sintered





On this 4340 ***STEEL*** *application*

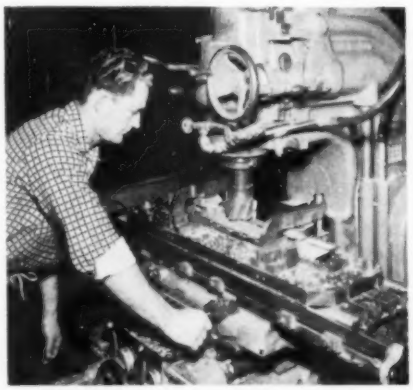
Sonnet Helicarb Helical Carbide Slab Mills cut floor-to-floor time 57%

The Talley Machine & Manufacturing Corporation, Los Angeles, uses a 5" "Helicarb" Slab Mill on a ⅛"-deep slab cut. Formerly high speed steel cutters were used for the same operation, completing the cut in 3½ minutes. The change to "Helicarb" Cutters cut floor-to-floor time to 1½ minutes, *enabling two parts to be produced in less time than formerly required to produce one.*

The operator also reported that after 100 parts, "the Helicarb cutter was still sharp; many more cuts could be made before resharpening."

No secret to the amazing efficiency of "Helicarb" cutters. Since the included cutting angle is uniform over the full length of the flute, the cutter cuts with a shearing action as contrasted with the impact of a straight-tooth carbide cutter. Finishes, too, are improved, with 20 r.m.s. and better not unusual.

Right now hundreds of shops are enjoying the competitive advantage these new cutters give them. Why not you? A "Helicarb" Catalog can be had for the asking by writing Sonnet Tool & Mfg. Co., 574 No. Prairie Avenue, Hawthorne, California.



ALUMINUM **applications show even better results.** Airframe manufacturers and sub-contractors are now using "Helicarb" cutters widely. Above, a standard 4" "Helicarb" Shell Mill, ground with a radius, is used for a simultaneous facing and side milling operation on an aluminum casting at Chrysler Corporation's Los Angeles plant. The 2-inch-long helical flute, possible with "Helicarb" design, enables the cut to be made in one pass, eliminating multiple cuts which might create stress points.

carbide tools may be used on the hydraulic plate edge planer.

Rockford's patented Triple Circuit, used on this machine, permits three speed ranges and three force ranges — all infinitely adjustable. Any speed range may be selected and adjusted to a direct reading tachometer by push-button control.

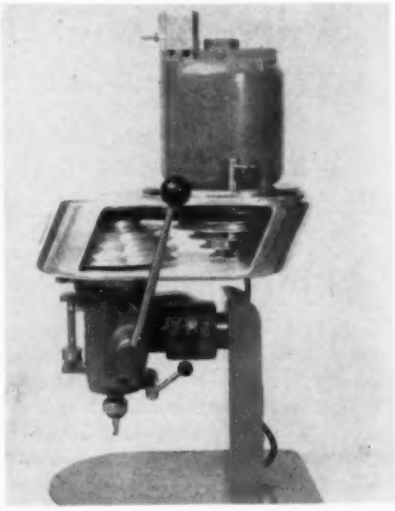
Further details are available from the manufacturer, Dept. X, Rockford, Ill. **T-6-1601**

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Universal Head

Development of a universal vertical head that will convert horizontal machines to all-angle verticle mills quickly and economically has been announced by the Rotex Punch Co., Inc., 2350 Alvarado St., San Leandro, Calif.

The new head is a self-contained, independent, five-speed, motor-driven unit that can be positioned angularly with



the spindle lever-locked in any position. A micrometer adjustment on the quill front gives complete cutting measurements up to 0.001 over a two-inch travel. Primary job measurements can be made by the use of a sliding dial attached to the quill handle shaft. The quill handle is so designed as to permit its placement in the most suitable position for a particular job or operator without moving the quill.

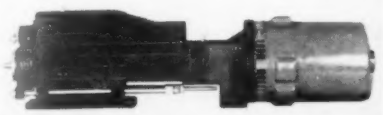
Five spindle speeds (390, 710, 1200, 2500 or 5200 rpm's) are provided by a one-third horsepower, 110-volt, single-phase, reversible motor. Spindle speeds can be changed in a matter of seconds.

Standard "Y" type collets are available from 3/16 to ½ inch. **T-6-1602**

Direct-Tapping Unit

Controlled-Air-Power device for direct-spindle tapping without the use of tapping heads or clutches has been introduced by The Bellows Co., Akron, O. Basically the unit consists of a Bellows-Locke model 5-E drill unit with a special, inline-mounted, G-E hi-slip motor for 220/440 v, 3-phase operation. Standard shaft speed is 1140 rpm, although other speeds also are available.

The unit features rapid air-powered approach to the work and smooth hydraulic feed through the work at any



preset rate desired. Spindle traverse is adjustable from zero to three inches; thrust is approximately three times applied air pressure.

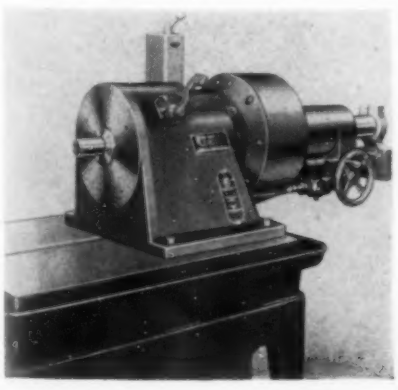
Tap sizes can range up to 5/16-18 or 3/8-24 in mild steel. Any tap holder that will fit the Jacobs #2 spindle taper may be used. The unit is capable of continuous duty at rates up to sixty reversals per minute.

Units may easily be grouped for multiple operations, and they may be mounted at any angle in any plane.

T-6-1611

Precision Boring Device

Hydro-Borer Co., 1601 E. Olympic Blvd., Los Angeles 21, Calif., has engineered a series of precision boring units for semiautomatic and fully automatic work Control. They are easily tooled to production needs and easily adapted to changing job requirements. They achieve work tolerances within 0.0003 inch and quality of finish of 20 micro-



inches and better.

These new Hydro-Borer series "N" units can be set for rapid approach to within 0.015 inch of the piece to be bored, at which point the standard Hydro-Borer hydraulic feed automatically takes over and bores at 0.004 ipr. When it completes this stage, the Hydro-Borer automatically repeats the cycle or returns, depending on the setting. There can be an infinite number of such successive rapid approach and boring operations within the stroke of the unit.

Features of the N series include an electronically controlled, air-actuated, automatic rapid travel mechanism with adjustable controls for successive rapid travel and boring operations.

Feed is positive and chatterless and without pulsation; is 0.004 ipr which is reducible to 0.002 ipr when an extra fine finish is required. **T-6-1621**

Centerless Grinding Unit

A small-sized, general-purpose centerless grinding machine, the No. 0, is announced by Cincinnati Grinders Inc., Cincinnati 9, Ohio.

Especially designed for the wide range of metallic and nonmetallic parts ranging up to ½ inch in diameter, its reduced requirements of power consumption, floor space, and capital investment make it an efficient, low-cost producer of small parts.

The grinding wheel spindle is mounted in Cincinnati's exclusive Filmatic spindle bearings which are self-adjusting for heavy roughing cuts or light cuts. Spindle lubrication is automatic and positive, and an automatic cutout is provided to stop the spindle driving motor if lubricant pressure should fail.

Regulating wheel speeds are infinitely variable, under the control of a single handwheel, from 22 to 300 rpm to permit selection of the exact speed required for efficient cutting on any particular job.

Grinding wheels on the unit are 16-inch maximum diameter with 10-inch diameter hole and maximum width of 4 inches. Regulating wheels are 9-inch maximum diameter with 4-inch diameter hole and maximum width of 4 inches. They mount directly on the end of the regulating wheel spindle; no wheel mount is required. **T-6-1622**

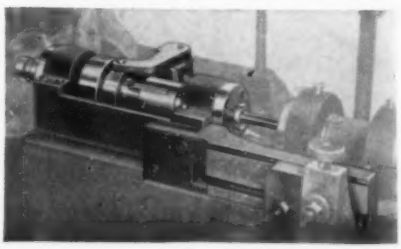
Automatic Lathe

A sliding head automatic lathe, the Howard D-187, built domestically to American standards by Howard Automatic Div., Detroit Cam & Tool Co., Ferndale, Detroit 20, Mich., mass produces parts up to $\frac{3}{16}$-inch diam, $2\frac{3}{4}$ inches long.

Using the same machine base, power units and tooling employed on the earlier ½-inch capacity Howard D-500, especially high finish is achieved by spindle speeds up to 15,000 rpm, under pressure lubrication.

Tolerances of 0.0002 inch are held through the entire spindle length by a new, highly sensitive sliding head with completely independent pulley carrier bracket.

Attachments for drilling, chamfering, counterboring, tapping, threading, slotting and tapering are interchangeable on both models. **T-6-1623**



Electric Micrometer

An electric micrometer introduced by The Ingersoll Milling Machine Co., Rockford, Ill., which was developed to provide a means for checking vertical alignment and lateral horizontal alignment over substantial distances where conventional micrometers cannot be used effectively.

It was designed to give fast and accurate readings within 0.0002 inch, an accuracy comparable to that of optical instruments. It can be operated by any-

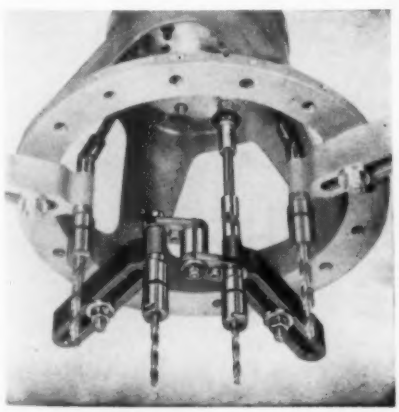
one familiar with a standard micrometer.

The electric micrometer is compact and sturdy, and of simple construction.

Furnished with the micrometer are a magnetic-base platform and a C-clamp to permit mounting the instrument almost anywhere and in any position. **T-6-1631**

Multidrill Attachment

A Twin-Spindle attachment for all models of its multidrill, which permits driving two collect type spindles from any one of the unit's spindles, has been announced by the Commander Mfg. Co.,



4225 W. Kinzie St., Chicago, Ill. In effect, the attachment adds an extra spindle for each of the drill's standard six or eight spindles, enabling the user to drill up to double the normal number of holes at one time.

A direct gear train provides maximum efficiency for the driven spindle, yet permits setting the two spindle centers as close as ⅞ inch and a maximum of 3 inches wide. Maximum capacity of the Twin-Spindle attachment is ¼ inch in steel. **T-6-1641**

Balancing Unit

The Taylor Dynamometer & Machine Co., 6411 River Pkwy., Milwaukee 13, Wisc., are producing a SB Series of balancing machines that feature speed button control to replace the hand-operated lever for operation. This consists of two pushbuttons which activate a pneumatically operated lifting device to balance the piece part involved.

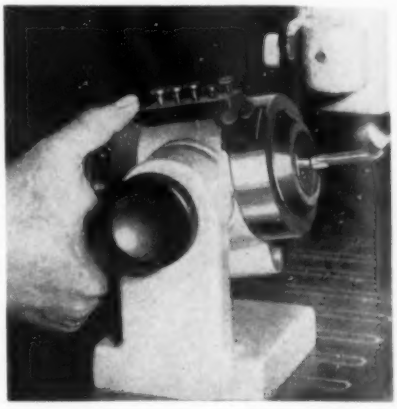
Main advantages of the Speed-Button Balancer lie in reduced operator fatigue, reduced possibility of damage to the machine by unskilled operators and increased hourly production.

A number of SB models are available, to handle very light piece parts as well as parts as large as 60 inches in diameter. **T-6-1642**

Portable Tap Sharpener

The Rockford Die & Tool Works, Inc., 1816 Seventeenth St., Rockford, Ill. has introduced a new tap sharpener, the Rocket, which makes it possible to resharpen either right of left-hand taps of two, three, or four flutes in about three minutes. It can be used on any make or any size grinder with a magnetic chuck.

Equipped with one ½-in collet it will accommodate any standard 5-C collect of ⅛ to 1-inch capacity. The first liner sleeve is off center to cut radial clearance on tap. The second liner sleeve is on dead center for indexing purposes. **T-6-1643**

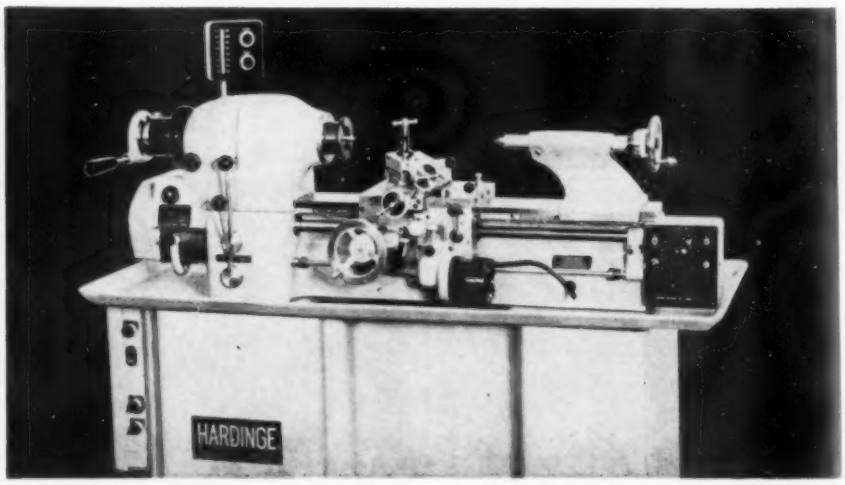


High-Speed Lathe

Pushbutton infinite spindle speed control and an independent electric carriage and cross slide are combined in the new Model HLV high-speed precision toolroom and production lathe designed by Hardinge Bros., Inc., Elmira, N. Y. Spindle speeds, controlled from a continually located pushbutton control box, may be selected from any speed between 125 to 3000 rpm. The exact spindle speed is indicated at all times on the control box. Rate of carriage and cross slide feed is controlled independently from the spindle speed, which permits the exact combination of spindle speed and carriage feed for a specific job. The machine does not have to be stopped to make any changes in either speed or feed.

Other features of the lathe include a lever-operated collet closer for fast, easy collet regulation and instantly adjustable collet tension.

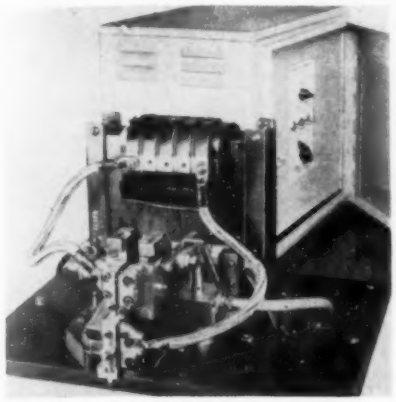
A built-in spindle handwheel provides a safe, convenient means for rotating the spindle by hand. **T-6-1644**



Small Parts Welder

A semiautomatic oil hydraulic operated machine for butt welding materials 0.015 up to ⅛ inch diameter and tubing 1/16 to ¼ inch OD has been designed by Federal Tool Engineering Co. (Tweezer-Weld) of Cedar Grove, N. J.

The machine can be successfully adapted for almost any shape material. Welding can be accomplished by means



of a condenser discharge power supply or by a synchronous timer operating from 1 up to 5 kva.

Parts are hand fed into a fixture against a stop, clamped, and butt welded in fast sequence.

Clamping pressure between the jaws is 1200 psi. Direct force between the parts to be welded is 1000 psi.

The machine itself is mounted on a portable table with wheels and can be moved easily.

Minimum production rate attainable is approximately 700 parts per hour.

T-6-1651

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Carbide Lapping Machine

Wickman Mfg. Co., 10325 Capital Ave., Oak Park, Detroit 37, Mich., has made available an unusual super finishing machine for carbide tools to enable users to obtain much longer cutting life.

On this inexpensive super finishing machine, a highly finished lapped cutting edge can be obtained in a few seconds at low cost. A small diamond impregnated finishing hone laps the cutting edge of the carbide tool with a reciprocating movement in four directions in a vertical plane until the required finish is obtained.

Carbide tools are super finished with-

out generating heat. Untrained workers can finish tool cutting edges without danger of spoiling the tool, damaging the stones or the machines.

Although in Europe, where it was developed, the tool has been used for some time, it has only recently been introduced in the United States. Exclusive manufacturing and distribution rights for the U. S. are owned by Wickman Mfg. Co. **T-6-1661**

Grinding Wheels for Hard Steels

Macklin Co., Jackson, Mich., has developed an aluminum oxide material MM process wheel for use on hard-to-grind steels.

Fine grain in pellet form, distributed throughout the wheel, gives a constant flow of fine abrasive between the wheel and the work which results in a self-dressing action. Because of this self-dressing feature, a particular grade is adaptable to a wider range of materials.

Advantages of the wheel are cool cutting action, combined with fast stock removal and unusually long wheel life.

It may also be successfully applied to both internal and external grinding. **T-6-1662**

Powered Index Tables

The Cleveland Tapping Machine Co., Canton, Ohio, has announced a power-driven automatic index table.

Available in 21 and 34-inch table diameters with 6, 8 or 12 stations, these tables are operated by a Geneva drive, using a needle-bearing cam follower. The tables are engineered so that at no time during their operation can they be free-wheeled, and cannot, therefore, get out of time or misindex.

Both models are furnished with tables equipped with locators for interchangeable top plates and can be furnished with an adaptor which permits hori-

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TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-6-210-3	Ace Drill Bushing Co., Inc.	**Drill Bushings**—Catalog G describes Ace bushings and states sizes. (Page 210)
A-6-260-3	Air-Mite	**Air Presses**—Catalog gives complete description of Air-Mite presses and cylinders. (Page 260)
A-6-172	B. C. Ames Co.	**Dial Indicators**—Ames' micrometer dial indicators and gages are discussed in catalogs. (Page 172)
A-6-199	F. E. Anderson Oil Co., Inc.	**Coolants**—"Case Histories of Lusol at Work" are available on request. (Pages 198-199)
A-6-205	Anocut Engineering Co.	**Electrolytic Grinding**—Manual presents practical application, theory and benefits of electronically controlled electrolytic grinding. (Page 205)
A-6-248	The Bellows Co.	**Air-Power Devices**—Bulletin CL-50 tells the economies possible and other advantages from the use of Bellows' pneumatic equipment. (Page 248)
A-6-230-2	The Black Drill Co., Inc.	**Precision Vises**—Booklet describes the features of Black "Centr-Finder" vise. (Page 230)
A-6-66	The Blanchard Machine Co.	**Surface Grinders**—Two booklets, "Work Done on the Blanchard" and "The Art of Blanchard Surface Grinding", discuss the advantages of the Blanchard grinder. (Page 66)
A-6-213	Campbell Machine Div. American Chain & Cable	**Abrasive Cutter Machine**—Bulletin DH-260 gives specifications and operating features of new Model 28 dry cutter. (Page 213)
A-6-245	Carboloy Dept. of General Electric Co.	**Carbide-Equipped Dies**—Carboloy die engineering manual D-124 is available on request. Complete details on Carboloy Die Training School are also available. (Page 245)
A-6-200-2	Case-Maul Mfg. Co.	**Toggle Clamps**—Catalog B-121 describes the versatility and wide range of sizes of Red Head toggle action clamps. (Page 200)
A-6-246-2	Comtor Co.	**Dial ID Gages**—Facts concerning Comturplug interchangeable expanding plug gages for simple and special bores are contained in Bulletin 48. (Page 246)
A-6-241	The Cushman Chuck Co.	**Power Wrenches**—Bulletin 211D fully describes and illustrates the Cushman power wrench. (Page 241)
A-6-249	Danly Machine Specialties, Inc.	**Die Springs**—Die spring selection procedure is detailed and worked out in catalog. (Page 249)
A-6-227	Delta Power Tool Div. Rockwell Mfg. Co.	**Drill Presses**—Catalog describes and illustrates the new line of Delta 14-inch drill presses. (Page 227)
A-6-180	Dumore Co.	**Drill Units**—Series 24 catalog points out the economies available by using Dumore automatic drill heads. (Page 180)
A-6-270-4	Elgin National Watch Co.	**Diamonds**—Booklet describes how diamonds cut finishing costs and tells how to use diamonds most economically. (Page 270)
A-6-197	Engis Equipment Co.	**Diamond Compounds**—Technical bulletin T-655 tells what advantages are obtainable with Hyprez diamond powders. (Page 197)
A-6-247	The Fellows Gear Shaper Co.	**Gear Shapers**—"The Art of Generating with a Reciprocating Tool" gives information on the design and machining advantages inherent in the Fellows Method. (Page 247)
A-6-264-1	Galland-Henning Nopak Div.	**Hydraulic Valves and Cylinders**—Catalog 101 and Bulletin SW-3 discuss the advantages of Nopak equipment. (Page 264)
A-6-41	The Hartford Special Machinery Co.	**Drill Units**—Drill unit catalog describes the complete line of drill units. (Pages 40-41)
A-6-175	Hydraulic Press Mfg. Co.	**Hydraulic Components**—The complete line of H-P-M components are available in a condensed catalog. (Page 175)
A-6-200-1	Hydro-Line Mfg. Co.	**Hydraulic Cylinders**—Design and other features of Hydro-Line cylinders are discussed in Bulletin 53. (Page 200)
A-6-267	Ingersoll Milling Machine Co.	**Insert-Type Milling Cutter Blades**—Economies of blade replacement and description of other Ingersoll products are described in Catalog 60F. (Page 267)
A-6-26	Keller Tool Div. Gardner-Denver	**Air Drills**—The possibilities and features of Airfeedrills are described in Catalog Sections 92 and 92A. (Page 26)

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A-6-8	Landis Machine Co.	**Centerless Thread Grinders**—Specifications and additional information for Landis grinders are contained in Bulletin E-97. (Page 8)
A-6-201	Lapeer Mfg. Co.	**Clamping Equipment**—Complete line of stationary and portable clamps, pliers and wrenches are discussed in catalog. (Page 201)
A-6-152	Lehigh, Inc.	**Lathe Tracing Attachments**—Catalog and engineering bulletins discuss tracing and duplicating attachments. (Page 152)
A-6-55	Meehanite Metal Corp.	**Iron Alloys**—"The Handbook of Meehanite Metals" is available on request. (Pages 54-55)
A-6-211	National Broach & Machine Co.	**Broaching Fixtures**—Bulletin B54-9 discusses the Red Ring self-contained broaching fixture. (Page 211)
A-6-188	C. A. Norgren Co.	**Tool Lubrication Systems**—Complete details and case history data for Spray-Lube systems are contained in form 491B. (Page 188)
A-6-256	The Ohio Knife Co.	**Die Sections**—OK composite die sections and clad aluminum bronze wear plates are described in new bulletin. (Page 256)
A-6-186	O'Neil-Irwin Mfg. Co.	**Die-Less Duplicating Machines**—Bending manual gives methods for bending a variety of materials. New catalog gives time-saving duplicating techniques. (Page 186)
A-6-272	Pines Engineering Co., Inc.	**Benders**—"Pines News," a bi-monthly mailing piece, gives facts on new, cost-cutting bending operations. (Page 272)
A-6-238	Pioneer Tool Engineering, Inc.	**Aluminum Tooling Material**—Catalog 921-T shows complete range of applications, mechanical properties, stock sizes and special cast sizes. (Page 238)
A-6-221	R and L Tools	**Cutting Tools and Components**—Catalog tells the precision and time-saving qualities obtainable with R and L Tools. (Page 221)
A-6-240-3	J. A. Richards Co.	**Benders**—Illustrated folder TE-5 describes the Multiform Big Brother bender. (Page 240)
A-6-231	Rivett Lathe & Grinder, Inc.	**Air Valves**—Working drawings, specifications, cut-away views and other data required for good circuit layout are contained in 12-page booklet. (Page 231)
A-6-67	A. Schrader's Son Div. Scovill Mfg. Co., Inc.	**Air Cylinders**—Information concerning Schrader air cylinders is obtainable on request. (Page 67)
A-6-182	Scully-Jones & Co.	**Cutting Tool Components**—Bulletin 20-50 discusses tap drivers; Bulletin 10-50, recessing tools and Bulletin 2-50, arbors and adapters. (Page 182)
A-6-237	Simonds Abrasive Co.	**Centerless Grinding Wheels**—Performance and specifications for grinding wheels for centerless grinders are discussed in Bulletin ESA-55. (Page 237)
A-6-203	The S-P Mfg. Corp.	**Air Cylinders**—S-P heavy-duty cylinders are discussed in Catalog 109. Standard air cylinders are described in Catalog 102. (Page 203)
A-6-196	Tomkins-Johnson Co.	**Hydraulic Cylinders**—Bulletin SM-454-2 discusses the versatility of T-J cylinders. (Page 196)
A-6-224	The Torrington Co.	**Rotary Swagers**—Booklet contains detailed descriptions of the Torrington rotary swagers. (Page 224)
A-6-150	Valenite Metal Corp.	**Tungsten Carbide Tools**—Catalog A-4 tells the complete story of Valenite tools. (Page 150)
A-6-192	Valvair Corp.	**Air and Hydraulic Components**—Combinations possible with nine different control assemblies are discussed in Bulletin A-14. (Page 192)
A-6-208	Verson Allsteel Press Co.	**Presses**—Catalog G-53 presents basic data on the Verson line of presses. (Page 208)
A-6-22	Vlier Engineering Inc.	**Jig and Fixture Clamps**—Clamps and other Vlier tooling specialties are described in new catalog. (Page 22)
A-6-9	The Wade Tool Co.	**Hand Screw Machines**—Drive and other features of Wade No. 73 machine are discussed in circular 73. (Page 9)
A-6-189-2	Willey's Carbide Tool Co.	**Tungsten Carbide Tools**—Catalogs describe the complete line and give price lists of Willey's carbide tools. (Page 189)
A-6-230-5	Woodson Tool Co.	**Miniature End Mills**—Micro end mills for small jobs are described in catalog. (Page 230)

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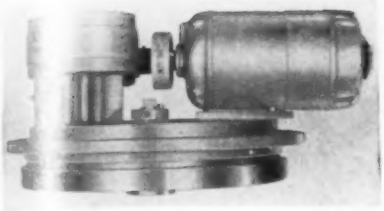


zontal mounting for use as the drive for an indexing drum.

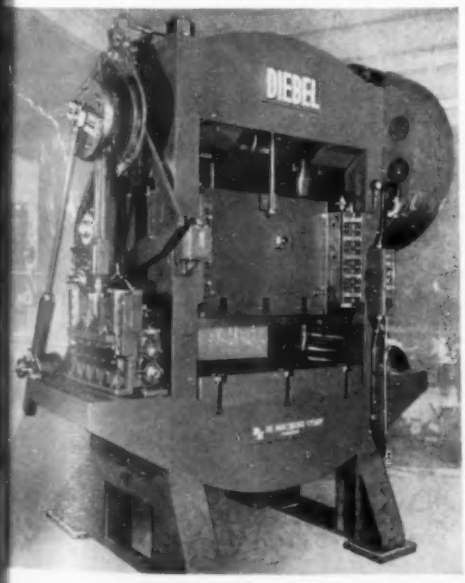
The 21-inch model is driven by a ¾ hp motor and has a load capacity of 400 lb with an indexing cycle of 1.5 sec under normal operating conditions. It may be equipped with top plates up to 32 inches in diameter and, with a work cycle of 3 sec, is capable of 800 operations on hour.

The 34-inch table, driven by a 1-hp motor, will carry an 800-lb load with an indexing cycle of 2 sec under normal operating conditions. It may be equipped with top plates up to 48 inches in diameter and, with a work cycle of 4 sec, is capable of 600 operations an hour. **T-6-1691**

Automatic Press

A 100-ton double-crank welded steel press is offered to the mass production metalworking field by Di Machine Corp., 2701 W. Irving Park Rd., Chicago 18, Ill. Built with 40, 50 and 60 inches between uprights and 32 inches front to back, it offers speed range from 80-240 strokes per minute.

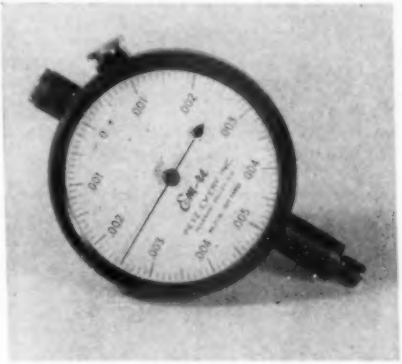
Features of the unit are the cylindrical type ram for accurate alignment, and air clamped feeds to prevent stock distortion and permit positive feeding. It is available with either single or double feeds and scrapcutter. **T-6-1692**



Dial Indicators

Recently developed "Em-re" dial indicators, available in twenty-four different models with graduations in 0.0001, 0.00025, 0.0005 or 0.001 inch with ranges from 0.025 to 0.250 inch, have been announced by Petz-Emery Inc., Pleasant Valley, N. Y. All models conform to American Gage Design specifications and have a bezel diameter of 2¼ inches.

The fully jeweled and completely shockproof movements of the indicators



give accurate, repeated readings on any application, whether on a production inspection job or a laboratory measurement. Consistently repeated readings to 20 millionths of an inch are reported on indicators of 0.0001-inch graduations.

To maintain accuracy, to obtain repeated readings, and to keep the measuring system free from wear, the indicators are designed to be shockproof at all points of the range.

The entire line of 24 models is built around only thirty-one parts, and all but six parts are common to all models. Disassembly and reassembly takes but a few minutes, requiring only a pair of tweezers and a small screwdriver as tools. **T-6-1693**

Diamond Holding Alloy

American Coldset Corp., 87 Court St., Paterson, N. J. has developed a diamond holding formula called m-28. Combined with an exclusive setting process, the new alloy guards against diamond loss even under difficult operating conditions.

Tools with an included angle of 45 deg and up and with a radius of 0.015 inch are recommended by the manufacturer as most economical. Angles of 30 deg or less and radii smaller than 0.010 inch should be avoided if possible. A slight modification in holder design may permit use of a heavier tool.

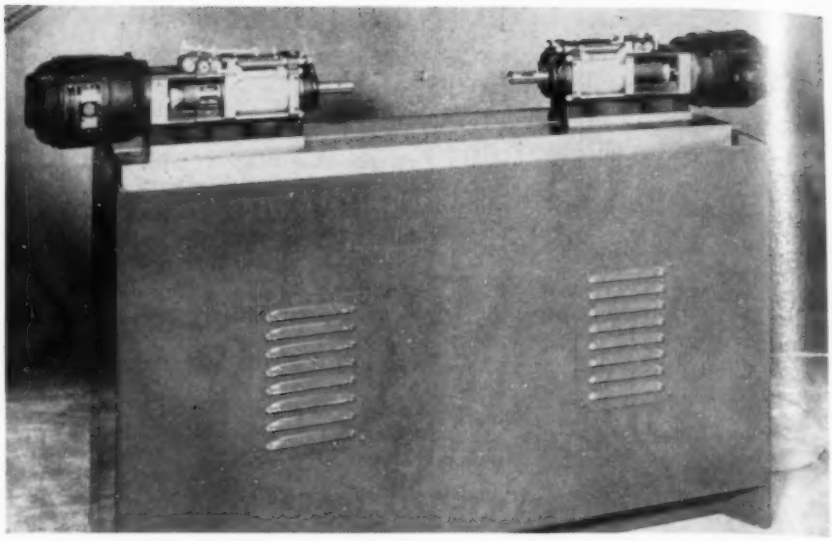
Features of Coldset shaped tools include guaranteed tolerance to give dia-

mond radius as specified within 0.0001 inch and center line of radius and locating flats co-linear within 0.0005 inch; interchangeability of matched tools made with corresponding dimensions similar within —0.0002 inch; and diamond selection to provide the right type, size and form of diamond for a specified application. **T-6-1701**

Machine Base

The M23C-1 double end machine base, shown with two Holomatic drill units mounted, was designed by Hause Engineering to simplify the building of automation-type special machines for drilling and/or tapping opposed holes.

Special tooling setups incorporating two drill units with standard hand or air-operated clamps, index tables, shuttle tables, trunnion fixtures or multiple spindle heads can easily be adapted to the base. Centering type operations are especially simple to set up.



Parts with holes from ½ to 24 inches apart can be machined.

The precision-ground cast semisteel top is 12 inches wide, 60 inches long and 4 inches thick and has a one-inch keyway the full length for accurate alignment of fixtures and machine components.

A large accessible area, provided for chip collection, is designed for easy maintenance and to facilitate mounting of a coolant pump-reservoir system.

Additional information is available from Hause Engineering, 809 S. Pleasant St., Montpelier, O. **T-6-1702**

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

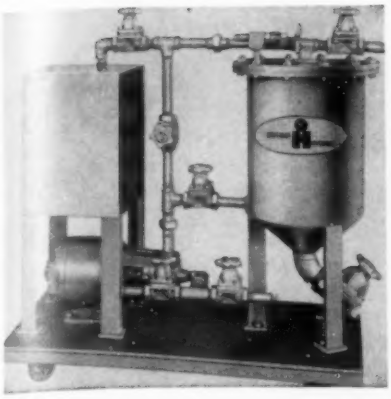
Filter for Plating Work

Removal of sludge formed by dissolving electrodes, and prevention of dust, dirt and oil contamination of metal parts during plating operations, may be done with the Hoffman-Hygrade self-cleaning filter developed by the U. S. Hoffman Machinery Corp., 105 Fourth Ave., New York 3, N. Y.

The filter uses a stainless steel wire-wound cylinder which supports the filter media, is noncorrosive and speeds up the filtration process.

Main features of the unit are: a new backwashing device, filtration at pressure up to 125 psi without leakage, tank capacities up to 5000 gal, a longer filtration cycle.

Maintenance is minimized because the filter requires no filter bags, sheets



or pads. Carbon treating and filtering are performed in one operation instead of the batch treatment. Filter aids are wood pulp, diatomaceous earth and carbon.

Compactly designed, the complete assembly consists of precoating tank, splash-proof electric motor, pump, filter pressure chamber, valves for suction and discharge flow and a pressure gage. The complete assembly can be mounted on a common base and transported to filtration areas anywhere within the plant. **T-6-1711**

Metal Patching Material

Availability of a new tool patching compound, called Mendite, has been announced by Bar-Lo Products Co., 1029 Main St., Hartford, Conn.

A nonflowing plastic metal paste of 100 percent solids, Mendite hardens in four hours at room temperature with negligible shrinkage and can be machined and finished with standard metalworking tools. It bonds well to metal and will act as a metal-to-metal adhesive.

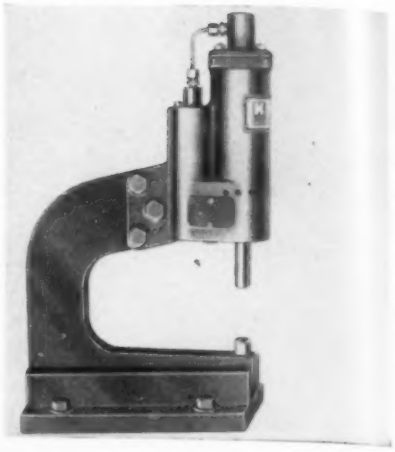
Resistance to gasoline and petroleum products makes it a suitable tank patch to prevent weeping. It has temperature stability at 300 F and can be used for tooling and molds for low temperature curing of plastics and rubber.

It is useful also for minor repairs and for smoothing pitted and gouged surfaces.

The material is available in pints, quarts and in bulk. **T-6-1712**

Spinner Riveter

Improvements on the spinner riveter made by Keller Tool Div. of Gardner-Denver, Grand Haven, Mich., permit increased operating control. Incorporated in the redesign is the adjustment that allows air to be diverted either to the spinner or to the hammer for balancing the relative speed of the spinner and the amount of force behind the rivet set. The hammer blows become



lighter as the spinning speed is increased, and heavier as the spinning speed is decreased.

This design change permits the spinner riveter to be adjusted so that rivet heads can be formed without danger of bending or swelling the shank.

T-6-1721

USE READER SERVICE CARD ON PAGE 167 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

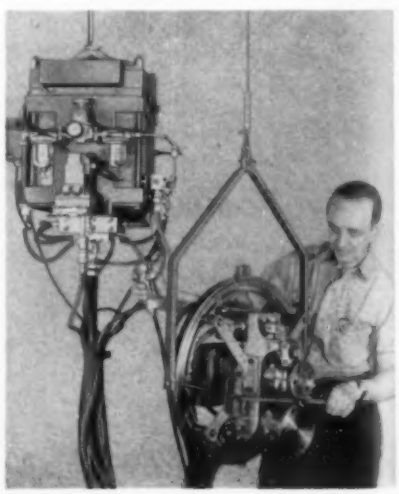
Portable Seam Welder

Progressive Welder Sales Co., 3070 E. Outer Drive, Detroit 34, Mich., has announced a portable seam welder designed to weld 200 inches per minute.

This new unit, which is lighter yet sturdier than previous models, will weld 180 deg vertical axis to 360 deg horizontal axis.

The welder wheels and shafts are assembled into one unit, which may be easily and quickly replaced.

Pressure up to 700 lb is applied on the welding wheels by an air cylinder. The lower wheel is driven by an air motor through a reduction gearbox to give a consistent drive. The air motor is reversible for versatility. **T-6-1722**



Trade Literature

For Free Booklets and Catalogs—
Convenient Request Card on Page 167

Wires

Illustrated 16-page booklet, DH-1226, describes ways of reducing machining costs with various shaped wires; pictures cross sections of common shapes available, outlines characteristics, properties, specifications and applications. Page Steel & Wire Div., American Chain & Cable Co., Monessen, Pa.

L-6-1

Joining Stainless

Twenty-four page booklet "The Joining of Crucible Rezistal Stainless Steels," describes in detail 17 methods of joining stainless steel by fushion processes, including manual, automatic and semiautomatic welding, brazing and soldering; also presents 8 flame and arc cutting procedures commonly used for stainless. Adv. Dept., Crucible Steel Co. of America, Box 88, Pittsburgh 30, Pa. **L-6-2**

Flame Hardening Equipment

Extensively illustrated catalog No. M-1851 describes company's Flamatic hardening machines and allied equipment; covers uses, special features and advantages; includes engineering drawings and specifications. The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. **L-6-3**

Drills, Reamers

Reedited 36-page handbook, "Drill and Reamer Facts" describes and illustrates design and construction of tools, offers instructions in use, care and maintenance; outlines grinding recommendations, proper feeds and speeds; divided into three sections: drill facts, reamer facts and carbide tool facts. Distributed free to colleges, technical, trade and engineering schools, and to individuals requesting on company letterhead directly to Whitman & Barnes, Plymouth, Mich.

Gap Presses

Company's G1 fabricated steel presses of 75 to 200-ton capacity presented in illustrated brochure explaining construction of equipment, and outlining special features and advantages; includes specifications. The Minster Machine Co., Minster, Ohio. **L-6-4**

Electrolytic Grinding

How electronic control makes possible automatic electrolytic grinding of cemented carbide and other hard-to-work materials discussed in 12-page illustrated manual; covers line of equipment used; describes theory and practice of process; outlines features and advantages in application. Anocut Engineering Co., 631 W. Washington Blvd., Chicago 6, Ill. **L-6-5**

Grinding Tools

Twenty-page catalog describes and illustrates line of grinding tools including complete details on recently introduced Precise Super 60 Power Quill capable of operating at speeds as high as 45,000 rpm. Also covers company's Grinder-Millers giving construction details, special features and specifications. Precise Products Corp., 1328-30 Clark St., Racine, Wis. **L-6-6**

Subland Tools

Six-page bochure illustrates and describes uses and merits of subland tools; outlines comparative advantages of these tools over standard and step drills in certain instances to provide uses and engineers with basis for selection. Detroit Reamer & Tool Co., 2830 E. Seven Mile Rd., Detroit 34, Mich. **L-6-7**

Brazing Alloy

Well illustrated folder describes properties and applications of Nicrobraz stainless steel brazing alloy; covers physical and chemical properties, typical applications. Stainless Steel Div., Wall Colmonoy Corp., 19345 John R St., Detroit 3, Mich. **L-6-8**

Work Holding Tools

Complete line of work holding equipment and jig fixture components presented in 64-page illustrated catalog; includes engineering data, application suggestions, specifications. Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland, Ohio. **L-6-9**

Forging Hammers

Twenty-page illustrated brochure covers design, construction features and operation principle of is self-contained Nazel Electro-pneumatic forging hammers; includes specifications and examples of specific installations and applications. Lobdell United Div., United Engineering and Foundry Co., Wilmington 99, Del. **L-6-10**

Optical Inspection Tools

Full line of optical measuring and inspection equipment presented in 70-page booklet; gives all basic details and specifications on more essential and commonly used equipment for precision metalworking industry, electronic manufacturers, instrument manufacturers, etc.; illustrated. Request only on company letterhead directly from George Scherr Optical Tools Inc., 200 Lafayette St., New York 12, N.Y.

Nonferrous Forgings

Various types forgings illustrated in 8-page brochure which also includes table of forgings data covering nominal composition of the alloys used, typical mechanical properties, electrical conductivity, commercial tolerances, government and engineering society specifications. Forgings Div., Scovill Mfg. Co., Waterbury 20, Conn. **L-6-11**

Magnesium

Eight-page pictorial folder, "The Magnesium Industry's Broadest Scope of Services in Fabricating, Assembling and Finishing" shows facilities and services for the working of magnesium and titanium. Brooks & Perkins, Inc., 1950 W. Fort St., Detroit 16, Mich. **L-6-12**

Toolholders

Catalog presents various style toolholders for round Throw-Away carbide blanks and round carbide inserts; each style is illustrated and described; includes details such as specifications, prices, suggested uses. Vascoloy-Ramet Corp., Waukegan, Ill. **L-6-13**

Punches and Piercing Tools

New services and tool items for piercing metal presented in illustrated 20-page catalog which outlines specific uses, sizes available, standard prices for line of punches and piercing tools and accessories. Request directly from Pivot Punch & Die Corp., 373 Old Falls Blvd., North Tonawanda, N.Y.

A-C Motors

Buying information on standard a-c fractional and integral horsepower motors presented in 28-page catalog GEC-1026 special section covers selection, covering horsepower requirements, enclosures, starting current limitations, speeds, motor types and selection of fuses and circuit breakers. Information on all motors includes, photos, ratings, prices, dimensions, weights, frame numbers and standard modifications. General Electric Co., Schenectady 5, N.Y. **L-6-14**

Chucks

Combination catalog No. W-200 and price selector presents company's Tru-Set line and Windsor line of chucks; features visual selection of desired chucks by immediately locating all information concerning individual chuck such as model and model number, type, type and number of jaws, chuck size, spindle nose and net price; illustrated. Horton Chuck Div. of the E. Horton & Son Co., Windsor Locks, Conn. **L-6-15**

Motor Pumps

Twenty-four page Form 2093-E covers entire line of close-coupled Motorpumps from ¼ to 75 hp for delivery of 5 to 2800 gpm. Bulletin is designed to simplify selection of correct size and model for specific job. Each class of pump is described and illustrated in detail; tables give dimensions, weights, performances and mountings. Section offers typical pumping problems with their solutions. Ingersoll-Rand Cameron Pump Div., 11 Broadway, New York 4, N.Y. **L-6-16**

Metalworking Machines

Six-page illustrated Bulletin No. 100 illustrates and describes company's basic models representing more than 50 different machines; includes technical data such as construction details, special features, advantages, specifications, applications. Kling Brothers Engineering Works, 1320 N. Kostner Ave., Chicago 51, Ill. **L-6-17**

Die Block Milling

Folder presents information on company's Rigidmils for miscellaneous die block milling; extensively illustrated to show various details of machine and its operation. Sunstrand Machine Tool Co., 2531 Eleventh St., Rockford, Ill. **L-6-18**

Preheat Chart

Recommended preheat temperatures for 79 commonly used metals and alloys listed in concise chart; also enumerates factors influencing temperatures and enumerates desirable effects of correct preheating on metal properties. Tempil° Corp., 132 W. 22nd St., New York 11, N. Y. **L-6-19**

Broaches

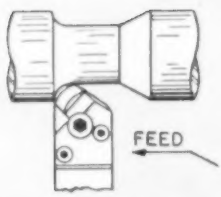
Revised catalog No. 450, extensively illustrated with photos, drawings and diagrams, covers broaches for internal, surface, keyway broaching; offers information on broach design, fixtures and typical broached parts. American Broach & Machine Co., div. of Sundstrand Machine Tool Co., Ann Arbor, Mich. **L-6-20**

You can do 90% of Your MACHINING OPERATIONS with nine styles of V-R TOOLHOLDERS

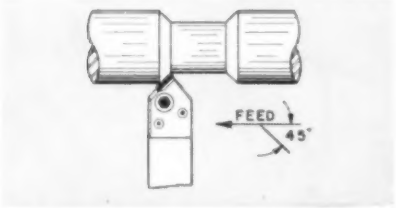
plus

"THROW-AWAY" BLANKS

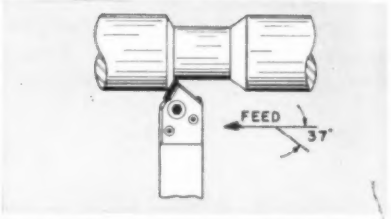
. . . at savings of 50% to 200%



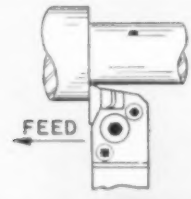
NEW PBR For turning, facing or plunge cutting. On large diameters the RBR makes an excellent boring tool.



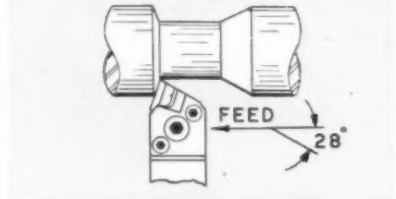
NEW TER With 45° lead angle for plunge turning, straight turning and chamfering.



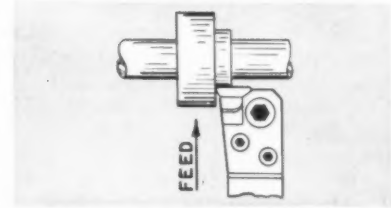
NEW TDR For plunge turning, straight turning, chamfering, and facing at 30°.



TAR For turning to a square shoulder with triangular inserts.



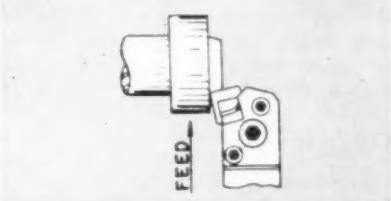
TBR For plunge turning with triangular inserts.



TFR For straight facing with triangular insert.

RAR For straight turning, facing and chamfering with a round insert.

SBR For straight turning, plunge feed turning, vertical turning, facing and chamfering.



SFR With 15° lead angle for vertical turning, facing and chamfering with square insert.

All V-R Toolholders Are Designed So They Can Be Ganged for Multiple Tool Set-ups

All V-R Toolholders are available in right or left hand styles. All styles are available for either "Throw-Away" inserts or standard 1½" inserts. Write for the New V-R Toolholder Catalog VR-435B with New Low Prices.

Vascoloy-Ramet Corporation

830 MARKET STREET, WAUKEGAN, ILL.

Makers of the World's Finest Carbide

Field Notes...

First **industry-owned** nuclear materials test reactor is to be built by Westinghouse Electric Corp. Cost will be about $6½-million, the largest commitment of private funds for an atomic power development facility by American industry. The reactor, which will operate in the range of 10,000 kw, will be used to test reactor fuel elements and other components of atomic power plants under actual operating conditions. It will be located near Blairsville, Pa. if Westinghouse's request for AEC approval of the site is granted.

V V V

Manufacturers, users and designers of centrifugal pumps, at a recent general conference called by the American Standards Association, voted to set up standards for low pressure process pumps. A national committee will be organized to develop American Standards for dimensions which will allow interchangeability of pumps made by different manufacturers. The chemical industry that proposed the project pointed out the benefits of standards would include an estimated savings to users of as much as $200 per pump through lower replacement costs, design time, construction labor, storeroom space and reduced maintenance costs.

V V V

Successful operation by Jones & Laughlin Steel Corp. of a laboratory-scale pilot plant for processing Michigan low-grade iron ore has opened a large reserve of that ore for industry. The plant, located at Negaunee, Mich., has demonstrated that these nonmagnetic ores can be rendered magnetic and then concentrated by simple magnetic separation. Increase in the scale of the development is planned until full-size commercial plants will be able to deliver high-grade concentrate to the company's eastern blast furnaces. The large reserves of nonmagnetic taconite ores contain about 30 percent iron. The J&L operation is designed to upgrade that ore to a usable concentrate containing as much as 63 percent iron.

larger quarters

Vickers Inc. has started work on a new 150,000 sq-ft building in suburban Detroit to house its engineering facilities as well as some executive and sales offices. Occupancy by early 1956 is expected.

V V V

Work is under way on the new $1,300,000 administrative and engineering office building for The Garrett Corp. The addition to its present AiResearch Mfg. Div. plant will provide

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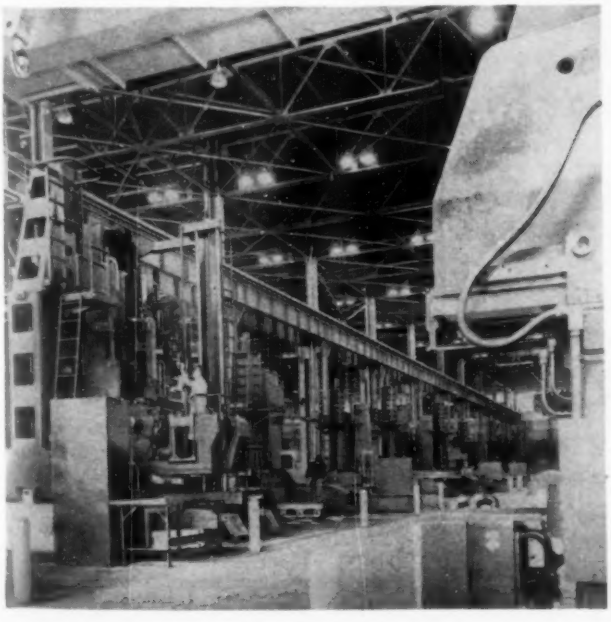
Mightiest forging operation in this country went into operation in May when production began at the Air Force heavy press plant operated by Aluminum Co. of America. The operation, utilizing a combination of 50,000 and 35,000-ton presses, represents a total installation cost of $40-million. Demand for the heavy presses was created by the urgent need to team light weight and high strength. Primarily, the program now provides the industrial capacity to forge structural members in one piece, resulting in stronger, lighter aircraft while appreciably lowering both machining and parts assembly costs. The plant is located in Cleveland, Ohio.



Above. The two giant presses pictured here are now at work producing aircraft structural components. In the foreground, the 35,000-ton capacity press rises 42 feet above the floor and extends 34 feet below. The 50,000-ton press in the background stands 50 feet above the floor and 36 feet below.

Left. This battery of tracer-controlled die-sinking machines cut the forging cavities in steel die blocks weighing many tons. The big die shop of the new Alcoa heavy press plant is one of the largest in the world.

a new headquarters for administrative officials, and will house some 1,000 members of AiResearch's engineering department.

v v v

New plant for manufacture of grinding wheels is being equipped for Norton Co. at 2555 Lafayette St., Santa Clara, Calif. The one story facility was purchased last fall with the intention of converting it into a warehouse. Later, it was decided to set up manufacturing operations there in order to provide better customer service in the far west. Renovation and equipment for the plant, which will be opened about January 1, 1956, is expected to cost approximately a million dollars.

purchases

Stockholders of the Mackintosh-Hemphill Co. have approved by a vote of approximately 91 percent, the sale of the company's assets to the E. W. Bliss Co. Mackintosh-Hemphill now becomes a division of Bliss, but will continue to operate its plants in Pittsburgh and Midland, Pa. No changes in operations or personnel are scheduled.

v v v

The Fray line of milling machines and milling attachments has been purchased from the Fray Machine Tool Co., by the Axelson Mfg. Co., Div. of U. S. Industries, Inc. Manufacturing of the equipment will now be carried on at the Axelson plant which has been turning out lathes and special machine tools since 1915.

anniversaries

A century of operation is being celebrated by Kingwell Bros. Ltd. in San Francisco. From a small organization which made padlocks for Wells Fargo money boxes and fog bells for ships, the company has developed into one of the largest foundries of its kind in this country and does an extensive business providing special parts with bronze bases for airplane components and for heavy machinery manufacturers.

v v v

Celebration of its 75th year in the screw machine products and set screw industries is being observed by George W. Moore, Inc. George W. Moore founded the company which bears his name in Boston in 1880 and turned out screw machine products in brass and steel such as those used for pianos. He maintained management of the firm until 1908 when at his request, his son took over management. Today, the company occupies its ultra-modern manufacturing plant built in Waltham.

new activities

Illinois Precise Casting Co. has been appointed a licensee foundry of Ampco Metal, Inc. In this capacity, the licensee foundry will produce only precision castings from Ampco Metal ingot by the lost wax method.

v v v

Establishment of the Ceramic Fiber Project as a new operating unit of the Carborundum Co. has been announced by company president, Clinton F. Robinson. The new unit will develop production techniques and applications of ceramic fibers, known as Fiberfrax, in addition to developing new products and conducting physical and market research.

oducto Machine Co. in conjunc- with the Bossert Co. has put in ation an assembly warehouse at and Main Sts., in Kansas City, to provide a faster die set service Missouri, Kansas, Nebraska, Colo- Oklahoma, Arizona, Texas, New ico and Utah. A complete line of ducto die sets, diemakers' acces- s and toolroom equipment is in- ded in the new assembly operation.

V V V

After many years of experience in the field, City Tool and Die Co., Muncie, Ind., has set up a specialized, separate department for the design, engineering and manufacture of transfer dies which can be used on most standard punch presses.

new companies

Formation of Osgood Machinery, Inc. as an affiliate of the J. L. Osgood Machinery & Tool Co. has been revealed. The new organization will distribute machine tools, presses and production equipment in the Syracuse area. Officers of the company, located in the Syracuse-Kemper Bldg., 218 Harrison St., Syracuse, N. Y., are A. L. Mikulec, president; C. E. Linden, Jr., vice-president; H. K. Rose, treasurer; S. Mikulec, secretary; and George R. Kinney, assistant treasurer. Mr. A. L. Mikulec and Mr. Rose are members of ASTE's Buffalo-Niagara chapter.

V V V

Formation of Anocut Engineering Co. has been announced by officers of the concern which is engaged in development and manufacture of equipment for automatic electronic control of electrolytic shaping systems. Executive offices for Anocut are in Room 2300, Board of Trade Bldg., Chicago, and manufacturing and laboratory facilities are at 631 W. Washington Blvd., Chicago.

V V V

Entry into a joint undertaking to engineering and market new, large high-speed electronic data-processing systems has been agreed to by Minneapolis-Honeywell Regulator Co., a leader in the automatic control field, and Raytheon Mfg. Co., prominent in the electronics industry. According to the announcement, the project will be carried out through the formation of a jointly-owned Datamatic Corp. in which Honeywell will have a 60 percent and Raytheon a 40 percent interest. Heading the new firm, which will be headquartered in Waltham, Mass., are president John J. Wilson, a vice-president of M-H; vice-president and general manager Walter W. Finke, who has been assistant to the president of M-H; vice-president J. Ernest Smith, Raytheon assistant vice-president and director of equipment engineering; treasurer David T. Schultz, Raytheon senior vice-president and treasurer; and secretary Paul F. Hannah, Raytheon secretary and general counsel.

expansions

A $750,000 expansion and modernization program is being completed for The Producto Machine Co. An extensive replacement program has brought the company's facilities up to date with the latest modern equipment to assist in all phases of its operation.

V V V

Construction has started on a new sheet and foil mill for Kaiser Aluminum & Chemical Corp. The 358,200 sq-ft structure will be located on the Ohio River near Ravenswood, W. Va. Completion is expected by the end of the year.

V V V

Construction of a new wing on the Oaks, Pa. plant has been started by Synthane Corp. which will add another

8000 sq ft to the existing area. The building, which will house the automatic screw machine department and provide increased facilities for other operations, will be the eighteenth major plant expansion since the original factory was built in 1929.

V V V

A half-million-dollar expansion program intended to facilitate research and to increase production of its plastic materials is under way for Marblette Corp. Completion date of the modern plant is scheduled for July 1.

V V V

More working space has been acquired by Pioneer Engineering and Manufacturing Co. to meet increased demand for its services. The additional facilities are at 3437 Goldner in Detroit.

V V V

A $1.5-million building is to be constructed this summer by Consolidated Engineering Corp. on a site adjoining the company's main plant in the Hastings Ranch area of Pasadena. It will house the research, engineering and marketing divisions.

V V V

Building No. 3 for Dreis & Krump Mfg. Co. has been completed. The new plant provides another 40,000 sq ft of space fully equipped to handle welding, frame machining and production-line assembly of the company's smaller model press brakes and presses of 11 to 150 ton capacities.

V V V

Modern plant facilities to accommodate increased production, larger offices and research operations have been completed for The Mitchell-Bradford Chemical Co. Among features of the plant is the straight line flow system planned for the manufacturing area which allows steady uninterrupted production.

moves

Executive offices and display rooms for Eastern Metal Products Corp. have been moved to 18 E. 41st St., New York 17, N. Y.

V V V

Arrangements for transfer of Morton Machine Works of Detroit to Millersburg, Pa. as a division of Brubaker Tool Corp. has been completed. Morton was purchased by Brubaker early this year at an estimated cost of $500,000.

Technical Shorts...

NOVEL METHOD of mounting stones in diamond tools has been devised by Dr. H. Tracy Hall, one of the G-E Research Laboratory team members responsible for creation of man-made diamonds. Dr. Hall mounts a considerably smaller diamond than is ordinarily used in a shallow cavity on the surface of a single-point wheel-dressing tool. Formerly a deep cavity would have been necessary since, in a conventional mount, as much as 90 percent of the diamond was buried in the tool in order to gain rigidity and prevent loss of the stone.

Mounting Method Offers Economy To Diamond Users

A secret of the process mounting is the use of titanium hydride as a wetting agent, and a solder such as silver-copper. Parts are brazed by induction or radiation heating in a high-vacuum system or in an atmosphere of very pure argon or hydrogen gas. Such mounting appears to give the stone rigidity enough to withstand most work. Under strength tests, a small diamond tip mounted on a microtone blade and revolved at 56,000 rpm placed a force of about 50,000 psi on the bonding area without dislodging the diamond.

The process offers promise of four advantages for industrial use: It anchors the diamond to its mount more securely; it avoids waste of the stone's "root," which often is three-fourths of the volume of the entire tool point; it permits mounting of smaller diamonds to provide the same working surface as formerly. Heat transfer is better when a diamond is bonded to metal than when it is held by a mechanical connection, and a cooler working diamond wears longer and is less likely to fracture from temperature shock.

* * *

RELATIVELY UNFAMILIAR but profitable phases of surface grinder applications are emphasized in a 16mm sound color film recently released by The DoAll Co. The movie examines new grinder features and attachments that permit application of equipment to a multitude of jobs other than ordinary flat grinding. Informative sequence scenes show uses of attachments to broaden versatility. Other scenes cover various methods of dressing the grinding wheel to achieve flat or shaped surfaces. Installation and operation of various types of wheel dressers are illustrated in this connection.

Film Demonstrates Surface Grinding

Another section of the film presents adaptation of standard grinders to automatic operation through use of standard attachments. Actual automatic production grinding scenes help explain various points as they are covered.

Arrangements for presentation of the film, "Extending the Range of Modern Surface Grinding, may be made through the Film Div. of DoAll, Des Plaines, Ill.

* * *

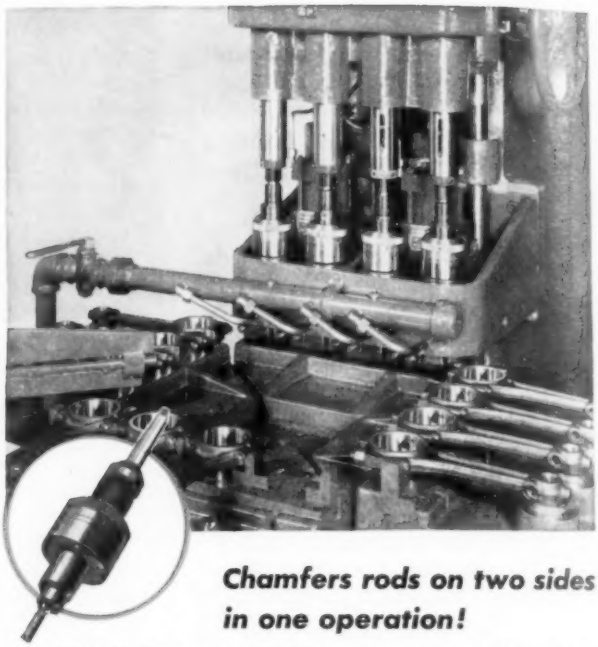
FABRICATION INTO thin, flexible, cold-rolled sheets is possible with the advent of a new type of lightweight, high-strength high-aluminum steel. The new compound, described in a research report released by the Department of Commerce's Office of Technical Services, is an iron-base alloy with 15 to 16 percent aluminum and approximately 3 percent molybdenum. Experimental tests on the substance indicated that stress-rupture life could be made 100 times that of the basic binary alloy at 1200 F.

Alloy Introduced For Special Uses

SCULLY JONES "Precision Holding" Tools bring you cost-cutting benefits for tapping, chamfering, milling!

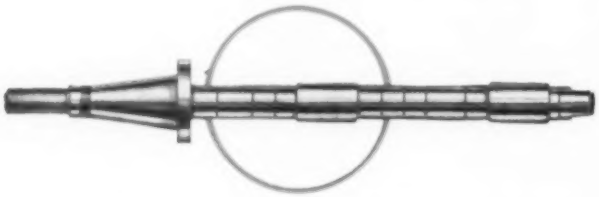
New Safe-Torque Tap Driver reduces tap breakage up to 100%

At Caterpillar Tractor Co., Scully-Jones Safe-Torque Tap Drivers made possible a 25% cost reduction, 10-12% manpower saving, 5% production increase, and 400% increase in tap life. You can save, too, by controlling adverse tapping conditions with this new adjustable Tap Driver because it releases instantly and completely when torque reaches the danger point. *Write for Bulletin 20-50.*



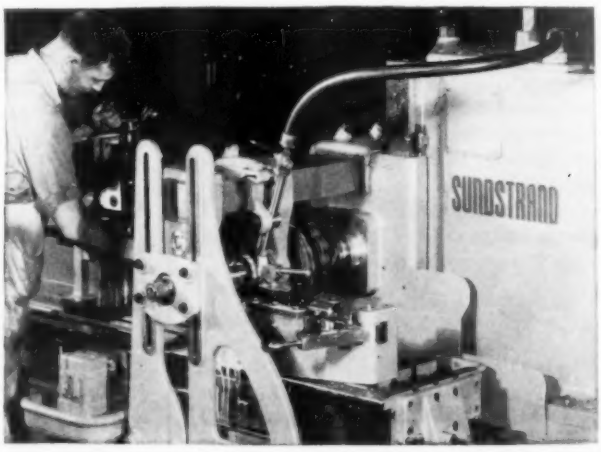
Chamfers rods on two sides in one operation!

At Studebaker Corp., Scully-Jones Automatic Recessing Tools prove their accuracy and speed. Each cycle they produce two chamfers in four connecting rod bores. The position of cutters for location and depth of cut is controlled within .001". Perhaps you have similar operations you can combine and simplify by using these *Automatic* Recessing Tools. *Write for Bulletin 10-50.*



Rugged Arbors assure long tool life at high speeds!

Rigidity of machine and tooling *is a must* for gang-milling these tough steel forgings . . . 46 per hour! Sundstrand specified Scully-Jones Style "B" Milling Arbors because they're tough and *precision built* to run true during fast, heavy cuts. Take the gamble out of milling with Scully-Jones Arbors and Adapters. *Write for Bulletin 2-50.*



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Men at Work . . .

Election of **Harold M. Schudt** to the presidency of Canadian Allis-Chalmers, Ltd. has been announced from the general machinery division of Allis-Chalmers Mfg. Co. The general machinery division of the parent company is in charge of operations of the Canadian firm. Mr. Schudt, who joined Allis-Chalmers in 1929, will be in charge of operations which include general offices in Lachine, Quebec, manufacturing plants at Lachine and St. Thomas, Ont., and sales offices in Montreal, Toronto, Winnipeg, Calgary and Vancouver.

He replaces **Mark C. Lowe** who resigned after having been president of Canadian Allis-Chalmers Ltd., since 1951.

According to announcement from Reed Roller Bit Co., **William D. Gilder** has joined the firm as chief metallurgist. Mr. Gilder, who brings with him 24 years of metallurgical experience, was formerly associated with the Weatherhead Co.

Following action by the board of directors of the corporation, **Roy C. Ingersoll,** president of Borg-Warner, has now assumed the title of president and chairman of the board. The post of chairman has been vacant since the death of C. S. Davis in July of last year.

Election of **Howard S. Bunn** as executive vice-president and a member of the executive committee has been announced by Union Carbide and Carbon Corp. Mr. Bunn, who became associated with Union Carbide in 1922, has been a vice-president of the company for two years and a director since last September.

Election of **Robert S Stevenson** to the office of president has been announced by the board of directors of Allis-Chalmers Manufacturing Co. Mr. Stevenson, who was formerly the company's executive vice-president, succeeds the late William A. Roberts.

Appointment of **E. M. Detwiler** as works manager of Lake Erie Engineering Corp. was recently announced. He has been general superintendent of the company since 1953.

At the same time, appointments to fill three other newly created offices were announced: **William H. Bennett** was made sales manager; **Robert J. Fuller** became assistant treasurer; and **Robert W. Gerhardt** was named sales project engineer for the company's line of die-casting machines. Mr. Bennett and Mr. Gerhardt formerly were with Hydraulic Press Mfg. Co., while Mr. Fuller became associated with Lake Erie last year.

The board of directors of the Lincoln Electric Co. recently made two executive appointments. **L. K Stringham,** who has been chief engineer for the company since 1951, was named vice-president in charge of engineering. **George Landis,** who formerly was engineering vice-president, was appointed vice-president in charge of research.

Later, two chief engineers appointed at Lincoln involved **Norman J. Hoenie,** who was promoted to chief engineer of the machine division, and **Emmett Smith,** who was named chief engineer of the electrode division. Prior to their appointments, both men were assistant chief engineers of their respective divisions.

Charles C. Layman has been made vice-president of sales and engineering for Turner Brothers, Inc. He formerly was sales manager of the company. At the same time, **Stephen T. Moreland** was named director of engineering for the firm. Mr. Moreland has been director of engineering for the R. P. Scherer Corp.

Wallace Leyda has been named chief metallurgist at Ohio Seamless Tube Div. of Copperweld Steel Co. Mr. Leyda goes to Ohio Seamless from Northern Indiana Brass Co. where he held a similar position.

Jack L. Modrich was appointed executive vice-president of the Hydro-Line Mfg. Co. Mr. Modrich, who has been with Hydro-Line since 1954, is considered an authority on the adaptation of hydraulic and air cylinders to automation problems.

Harry T. Burke has been named chief engineer of the Hastings Div. of E. W. Bliss Co. Closely associated with the design of presses and components since joining the firm in 1927, Mr. Burke helped develop the Bliss line of hydraulic presses.

Joseph J. Becka is new plant superintendent of The Barth Corp. and will take charge of all manufacturing operations of the company's Brookpart Rd. plant. Mr. Becka was formerly superintendent of the special machine division.

James A. Arter has been made vice-president in charge of manufacturing for Ampco Metal, Inc. Associated with Ampco in various managerial capacities since 1939, Mr. Arter now has direction of all phases of its manufacturing operations.

Karl Schwartzwalder, director of research at AC Spark Plug Division of General Motors Corp., has been elected president-elect of the American Ceramic Society for 1955-56.

Announcement of election of Donald **Roon** as its executive vice-president has been made by Houghton Laboratories, Inc. Prior to joining Houghton Laboratories, Mr. Roon was vice-president of marketing at Noudex Products Co., Inc.

M. W. Townsend, assistant to the president of Handy & Harman, was made a director of the company during a recent meeting of its board of directors.

Appointment of **Norman L. Deuble** to the post of manager of the newly created metallurgical development division of Climax Molybdenum Co. has been revealed. The new division will be responsible for development and dissemination of technical information pertaining to the use of molybdenum alloy steels in consumer markets, and molybdenum as an alloying material in the steel and foundry industries.

Appointment of **Paul E. Beattie** to the office of vice-president and general manager of the organization has been made public by O & M Machine Co., Inc. Prior to joining O & M, Mr. Beattie was associated with Western Industrial Engineering.

C. A. Norgren Co. has made public the appointment of **William O. Hall** as chief field engineer. Mr. Hall, who has been with Norgren for the past five years, most recently served as chief project and test engineer.

Russell M. Wheeler has been made chief engineer of the Seneca Falls Machine Co. while **Joseph Sawitzke,** formerly superintendent of Hendey Machine Co., was named manufacturing engineer for Seneca Falls.

Appointment to the vice-presidency of **Sheller L. Steinwender** has been revealed by The Permutit Co. Prior to joining Permutit, Mr. Steinwender was vice-president of the Scaife Co.

H. T. Peeples, assistant lubrication engineer, has been named to the post of lubrication engineer at The Timken Roller Bearing Co. He succeeds **Oscar L. Maag,** who has retired after 32 years of service. Following Mr. Peeples in the position of assistant lubrication engineer is **Wells E. Ellis** who has been a research metallurgist with Timken since 1948.

ho's Meeting · and Where

June 2-4. National Society of Professional Engineers. Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa. Write to society headquarters, 1121 Fifteenth St., N.W., Washington 5, D. C., for more information.

June 8-10. American Welding Society. Annual welding show, Municipal Auditorium, Kansas City, Mo. Spring technical meeting of the society to run concurrently June 7-10. For details contact society's management office, Suite 1006, 12 E. 41st St., New York, N. Y.

June 19-23. American Society of Mechanical Engineers. Semiannual meeting, Boston, Massachusetts. For more data write society office, Engineering Societies Bldg., 29 W. 39th St., New York, N. Y.

June 20-24. American Society for Engineering Education. 63rd annual meeting, Hetzel Union Bldg., Pennsylvania State University, State College, Pa. Direct inquiries to Prof. K. L. Holderman, General Chairman, 103 Mechanical Engineering Bldg., Pennsylvania State University.

June 24-26. Society of Women Engineers. Annual meeting, Hollywood Knickerbocker Hotel, Los Angeles, Calif. Complete information available from convention chairman, Mrs. Frances Rittamel, 3305-C West 83rd St., Ingelwood, Calif.

June 26-July 1. American Society for Testing Materials. Annual meeting, Chalfonte—Haddon Hall, Atlantic City, N. J. For more information, write society office, 1916 Race St., Philadelphia 3, Pa.

June 27-29. American Nuclear Society. First annual meeting, Pennsylvania State University, State College, Pa. Details may be obtained from society headquarters, Room 3000, 329 W. 41st St., New York 36, N. Y.

July 12-14. Western Plant Maintenance Show, to run concurrently with

Western Plant Maintenance and Engineering Conference, Pan Pacific Auditorium, Los Angeles, Calif. For full particulars, write show producers, Clapp & Poliak, Inc., 759 Monadnock Bldg., San Francisco 5, Calif.

Aug. 22-23. Stanford Research Institute and National Industrial Conference Board cosponsors of the Symposium on electronics in automatic production, Sheraton-Palace, San Francisco, Calif. Obtain further information from Public Relations Dept., Stanford Research Institute, Stanford, Calif.

Sept. 6-17. National Machine Tool Builders' Association. Machine Tool Show, International Amphitheatre, Chicago, Ill. Details concerning the exposition are available from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Sept. 6-17. Production Engineering Show, to be held in conjunction with the Machine Tool Show, Navy Pier, Chicago, Ill. Particulars may be had from show managers, Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

Sept. 6-17. Coliseum Machinery Show (formerly Metalworking Machinery & Equipment Exposition), Chicago Coliseum, Chicago, Ill. Write for details to Chester L. Wells, general manager, Exhibition & Convention Management, Inc., 2689 E. Overlook Rd., Cleveland 6, Ohio.

Sept. 12-16. Instrument Society of America. 10th annual instrument conference and exhibit, Shrine Exposition Hall and Auditorium, Los Angeles, Calif. Details are available from exhibit manager Fred J. Tabery, 3443 So. Hill St., Los Angeles, Calif.

Sept. 14-16. Porcelain Enamel Institute. 17th annual Shop Practice Forum, Ohio State University, Columbus, Ohio. Further details on program plans are available from institute offices, 1145 Nineteenth St., N.W., Washington 6, D. C.

Sept. 15-18. Packaging Machinery Manufacturers Institute. Annual meeting, Homestead, Hot Springs, Va. Complete details are available from institute office, 342 Madison Ave., New York 17, N. Y.

Oct. 24-26. American Standards Association and National Bureau of Standards, joint sponsors of Sixth National Conference on Standards, Sheraton Park Hotel, Washington, D. C., to be held coincidentally with 37th annual meeting of American Standards Association. Write for details to ASA offices, 70 E. 45th St., New York, N. Y.

Abstracts of FOREIGN LITERATURE

By M. Kronenberg
Consulting Engineer

Tolerances for Gears

Relationship between noise level of gears and the quality of engagement is the subject of recently published German Standards on gears. Details of these standards are discussed in two articles published by Karl Keck in issues number 7, 1954 and number 3, 1955 of *Werkstattstechnik und Maschinenbau*.

The noise produced by gears is mainly due to the error in the pitch, deformation of the shape of the teeth, the relative position of the engaging gears and friction. Even with perfect machining of the teeth and balancing of all dynamic forces it is impossible to eliminate noise entirely when spur gears are used, due to the fact that friction exists although it gradually reduces as the gears wear in. Different methods of grinding the teeth cause different noise levels. It was found that the Maag-grinder produces gears with a low-pitch noise while other grinders produce gears with a high-pitch noise.

Lubrication is, of course, helpful in reducing gear noise but fails to eliminate it because the oil film breaks down in the region of the pitch diameter. Gear vibration, the real origin of gear noise, can be reduced by making the gears rigid and by making the width of the gear greater than would theoretically be necessary. In helical gears, where the teeth are not parallel to the shaft, the friction is such that it balances above and below the pitch diameter and in this way, reduces gear noise. The author indicates that helical gears with greater tolerances (that is of lower quality class) are often less noisy and less expensive than spur gears of a higher quality class.

A significant relationship exists between the quality class and the pitch velocity (there are twelve standard classes in German Standar DIN 3961). This relationship affects the load-carrying capacity considerably but has not been included in traditional gear formulas used up to now. It is claimed that the new standards replace guess-

work by numerical data. For example, gears of quality class number 11 are recommended for use when the pitch velocity is about 400 fpm. When the pitch velocity is about 2500 fpm. quality should be increased to class 6. The higher the quality, the greater the cost. This is indicated by a diagram showing that the grinding time increases rapidly with the higher grades of quality. The author emphasizes the necessity of balancing cost and quality as facilitated by these standards.

Electron Microscope

A paper, discussing the development of the microscope for industrial purposes was authored by E. Brueche in the same issue of *Werkstattstechnik und Maschinenbau* as the preceding article. The author shows several illustrations of surfaces reproduced from microphotographs taken with an electron microscope, which permits magnifications of about 5000 times.

The author shows pictures of spheroidized cast iron, of aluminum surfaces, of razor-blade edges and also discusses the techniques involved in investigation of surfaces with the aid of the electron microscope.

Balancing of Grinding Wheels

According to a publication in issue number 2, 1955 of *Werkstatt und Betrieb*, a balancing method for grinding wheels has been developed by R. Skrizivan as described by him in *Stanki i Instrument*. The author indicates that the balancing of grinding wheels by counterweights is cost and time consuming when it is necessary to remove the wheel from the machine. Furthermore, when mounting the wheel it is quite possible to introduce a new unbalance. For these reasons the author has developed a balancing method where the counterweight can be moved during the rotation of the wheel. The reduction in unbalance can be measured and observed by means of a vibration measuring device, with quicksilver reflecting a light onto a screen. It is claimed that this method is very accurate and permits determination of amplitudes down to 0.000020 inch.

Investigation of Drop Hammers

The belt of a drop hammer is a most important member of this type of machine and subjected to heavy wear which affects the efficiency considerably. O. Voigtlaender has made a careful study on the stresses, forces, velocities, slippage, wear and other items. He has published his findings in an article in issue number 2, 1955 of *Werkstattstechnik und Maschinenbau*. The paper is supplemented by numerous diagrams. It indicates that the ram velocity can, under certain conditions,

exceed the circumferential velocity of the pulley causing a compression of the belt or great slippage.

The tension in the belt can be as high as five times the ram weight. It is recommended that adhesion between belt and pulley be determined on the theory of semiboundary lubrication, using an acceleration of 30 to 45 ft. per sec^2. The coefficient of friction should not be less than 0.5. It is particularly desirable to increase the coefficient of friction to as high as 0.8 due to the fact that at this value the points of highest wear are nearly equally loaded. Cooling of the belt is recommended using air applied to the inner surface of the pulley.

Superfinishing in Europe

An article on the present use of superfinishing machines and methods in Europe is published in issue number 2, 1955 of *Werkstatt und Betrieb*. The author, K. Haeuser, indicates that superfinishing has only been used in Germany for a few years but is now making rapid progress. He describes the superfinishing of cylindrical surfaces, of plane surfaces, of spherical surfaces and internal fine honing. The relationship between the material of the workpiece and of the hone is discussed, and recent American and European machines for superfinishing are compared. Photomicrographs of the surfaces produced are shown as well as illustrations of surfaces taken with the so-called interference measuring device.

Straightening of Bar Stock

Machines for straightening bar stock operate on the principle of the rolling mill according to an article by R. Hartl published in the February issue 1955 of *Werkstatt und Betrieb*. The author indicates that a difference exists between several types of straightening machines, namely, machines where the bar stock is stationary while the rollers rotate and machines where the bar stock rotates while the rollers are stationary.

Both systems are used for straightening and simultaneous stress relief of drawn bar stock as well as for descaling of hot rolled bar stock. The shape of the rollers is either concave or convex; they are arranged with their axes at an angle to the axis of the bar stock. Machines are also built for straightening and stress relief by this rolling process for various other shapes of bar stock including carbon steels, alloy steels, stainless steel, copper, bronze, aluminum and other metals.

Editor's Note: Due to a typographical error, the figure for machine tools in USA was given last month as 7,750,000 rather than the correct value cited by the author of 1,750,000.

good reading

HOLES, CONTOURS AND SURFACES. *Published by Moore Special Tool Co., 740 Union Ave., Bridgeport 7, Conn. Price $5 in U.S.A.; $6 elsewhere. 422 pp.*

This text discusses all phases of locating, cutting and grinding holes, contours and surfaces on a jig borer. It introduces the subject of linear form grinding, based on the performance of a newly developed machine for this purpose.

Among the subjects discussed in detail are: location, improvised location equipment and methods, the foundation of accuracy, jig boring and grinding principles and applications and practices and inspection methods. An added feature is a section of Woodworth circular tables for converting holes on circles to rectangular coordinates.

CONVERSION FACTORS AND TABLES *by O. T. Zimmerman and Irvin Lavine. Published by Industrial Research Service Inc., Masonic Bldg., Dover, N. H. Price $5. 525 pp.*

Conversion factors for many weights and measures are given in this revised second edition. A section for conversion factors is included for most foreign countries. Among the tables provided are: five-place logarithms, conversion factors for hardness and for foreign weights and measures, color scale conversions for liquids, conversion factors for principal viscosimeter scales, foreign monetary equivalents and wire and sheet metal gages. Definitions and fundamental values and abbreviations are also given.

VIBRATORY COMPACTING OF METAL AND CERAMIC POWDERS, PB111435. *Office of Technical Services, U. S. Department of Commerce, Room 6227, Commerce Bldg., Washington 25, D. C. Price $1.50. 42 pp.*

Significant advantages of low frequency vibration forming over conventional hydrostatic packing of nonplastic powders are reported in this book by government-sponsored experiments with fine alumina, alumina-chromium cermet, and titanium carbide-nickel cermet.

The ...boratory packing method proved faste... than the hydrostatic, and test spec...ens of better green strength were form... without binders, plasticizers or lubr...nts. Vibrated specimens retained near... exact dimensions, while hydrostati...lly formed specimens showed linea... shrinkage from 1.5 to 2.5 percent.

EXPLORATORY STUDY OF THE METAL BONDING OF ALUMINUM TITANATE AND OF MULLITE, PB111436. *Office of Technical Services, U. S. Department of Commerce, Room 6227, Commerce Bldg., Washington 25, D. C. Price $1.00. 7 pp.*

This report concerns preliminary investigations by the Wright Air Development Center into the bonding of mullite (aluminum silicate) and aluminum titanate with metals to form cermet bodies. Wetting and absorption tests, sintering processes and composition of cermets are detailed, and tables show sintering temperatures, porosity and modulus of rupture.

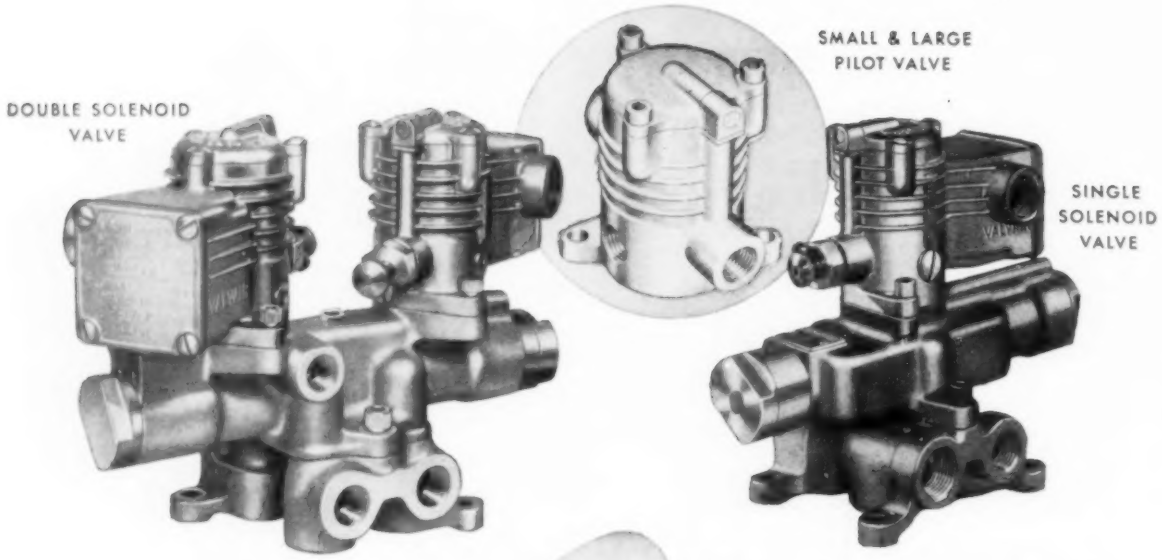
CONVEYORS AND RELATED EQUIPMENT *by Wilbur G. Hudson. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $9.00. 523 pp.*

This revised edition discusses the improvements in the construction of conveyor belts during the past ten years, and gives the current outlook on the savings of time, storage, space and labor costs. It also makes available an analysis of recent developments in pneumatic conveying and the resulting benefits to cargo shipping.

The author covers the technicalities of layout, maintenance suggestions, and performance possibilities, including the applications and limitations of each machine. Among the machines covered are screw, flight, apron crushers, bucket elevators, skip hoist, aerial tramways, hammer mills and pulverizers.

ROD, BAR AND WIRE PRODUCT INFORMATION. *Published by Kaiser Aluminum and Chemical Sales, Inc., 228 North LaSalle St., Chicago 1, Ill. Price $2.00; free on company letterhead. 160 pp.*

Information in this book was compiled to assist in the selection and use of the most suitable aluminum rod, bar and wire for different applications. It contains facts about the production of aluminum and its specific properties and characteristics as related to rod, bar and wire. Data for various alloys and their uses are also presented, together with discussions of fabrication and finishing methods.



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Future Prospects of Engineering

By C. R. Sutherland
Asst. Chief Engineer
Reliance Electric & Engineering Co.
Cleveland 10, Ohio

MAN AS A TOOL CREATOR has been transformed from a savage to an individual with untold power at his fingertips. Science, engineering and technology have made this evolution possible. The accelerated growth of new sciences and inventions is one of the major phenomena of this day. Likewise, the growth of industry can be attributed to an increase in technological science, or engineering.

Management of engineering activities requires thorough planning to assure a successful future. An understanding is needed of influencing factors which will determine the course of engineering planning. These factors are new technologies, competition, product requirements, manpower and others.

Financial analysts are closely watching the progress of outstanding firms who are actively engaged in engineering and research. They are well aware that one way to capital growth is through technological progress. This new friendship between investors and engineers has led to a greater understanding and confidence in technology. Also, many new industries and products have been created as a result of inventions. The competitive drive to keep abreast of new developments has made it necessary to allocate considerable engineering time to product development, product improvement and cost reduction.

New materials and processes make possible improvements and modifications of existing products. For example, invention of silicone varnishes has made possible electric motors with higher safe operating temperatures. Constant engineering study is required to keep a product current. Technical or social requirements quickly make a product obsolete.

Competition or the desire to create a larger market necessitates engineering for cost reduction. Design simplification, standardization and part elimination can do much to reduce cost of products. Automation is another direction for cost reduction. This will be employed in many industries to produce goods at lower cost. As a result of lower cost and higher volume, a larger total of people will be employed. The increase in the volume of office work is another concern of management. Industry is not alone in this concern. Insurance and banking are also involved in the problem. The future points to still greater volume of paperwork. However, much will be done to remove the deadly routine jobs. New office procedures will be instituted to enable industry to handle a greater volume at lower cost.

Population growth of the nation, aging of the working group and increase in the retired group will also have an effect. These changes in populations while not directly related to technology, will soon require the aid of science and technology to alleviate the critical balance between the growth of people and supplying their needs. Industry must keep pace with the demands for goods and services with a smaller working force. This will create a further demand for labor-saving machinery and lower costs. Services such as laundries, deliveries, amusements and medicine will increase. This means a greater demand for equipment, machinery and construction to support these services.

Attention to physical facilities, such as light, noise, space and air conditioning in engineering, results in improved morale and efficiency.

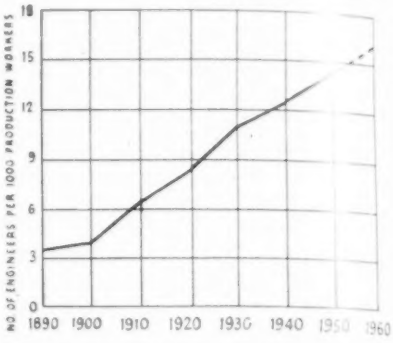
Templates can be used for standardized components frequently repeated, to increase output of draftsman. Savings to 30 percent are secured.

Another modern-day fact is the high continued rate of expenditure for national defense. Absorption of equipment and personnel in armed forces and atomic programs has been felt by all of industry. No major industrial engineering activity can ignore this situation.

Tomorrow's engineering must meet demands of progress. Whether or not an individual industy survives the economic gales and swells depends on the preparation and care that went into planning of engineering expenditures. These items include the cost of personnel, development, research, operations, equipment and miscellaneous.

How much engineering? This is a perennial question. The breadth and depth of tomorrow's engineering department must be established by the job it will have to do. Competition, development and technological advances have been cited as important economic forces. An industry that succeeds will have to establish the engineering force of the size to accomplish the job. Engineering expenditures are constantly rising. For example, it required 18 times more engineering in 1950 to design an automatic washing machine than was required for a 1928 model. Producers are fighting to keep ahead of cost. Engineers are looking for new ideas, principles, methods and materials to do the job more economically. This requires a greater engineering force simply because the problems are getting tougher and more complex.

Increased engineering activity is illustrated in the accompanying chart. Automation will increase the number of engineers still further. Engineering personnel has been in the public spotlight for many years. The reason was the sudden demand for engineers. Actually, there has been a steady increase in the number of engineers in industry. The profession has increased tenfold between 1890 and 1940. By 1948 the total number of engineers had increased 38 percent over 1940 with a total of 250,000 engineers. Requirements for engineering talent, it is estimated, will be 500,000 by 1960. This demand has been stimulated by the growth of research activity, new scientific and technological discoveries, military requirements and absorption of engineers in other fields such as sales and related nontechnological fields.



Number of engineers per thousand productive workers. Gainful workers include manufacturing, mining, construction, transportation and public utilities.

Scarcity of technical aid, such as draftsmen, laboratory helpers and engineering assistants is also increasing. More technicians are required than engineers in the average industrial plant. It is apparent that the future engineering budget will have to include some funds for training or securing adequate technicians also.

Future planning will have to take into account how to employ and train young technically and engineering minded men and how to function most effectively and efficiently with man-

Analog computer used for solution of complex electric motor drive problems.

power available.

The drive for simplified and improved office methods is being prompted by the need of holding down costs. Proper use and installation of office facilities is necessary to increase working efficiency of engineering departments.

Some areas for investigation include: space assignment, air conditioning, lighting, noise reduction, duplicating facilities, office equipment and specialized machines such as electronic calculators, record storage, associated facilities, such as telephones, teletypes and dictating machines. These items bear serious study. In one instance a concern reduced both cost and time to make customer data sheets by using offset printing. In another case, an electrical firm, by using electronic computers in the design of electric motors, has reduced a three-day calculation to fifteen minutes.

From a paper "Planning Tomorrow's Engineering Budget" given at the ASME Management Conference, March 23, 1955, Cleveland, O.

▼ ▼ ▼

Developments in Titanium Production

By James A. Roemer
President
Mallory-Sharon Titanium Corp.
Niles, O.

Ten years of experience have been accumulated with the new structural metal, titanium. The production phase has been particularly hampered by having to use a melting method completely different from that for commonly known structural metals. The company's new melting shop employs what is presently considered the most advanced method, using a consumable electrode, melting twice and performing these operations in a vacuum. This method "S", produces a homogeneous ingot and one which is essentially gas free.

Research and engineering effort are being devoted to improvements in the present process and entirely new melting methods are being investigated. Arc generation and control, further improvements in metal cleanliness by deoxidation during melting, and continuous casting, are under development and research.

Difficulties encounter in melting are indicative of production problems encountered in all phases of titanium manufacture. As the outset, the first titanium was rolled on existing equipment and it was soon discovered that

standard methods would not appl

Particularly, standard metho for heating and cleaning have been und inappropriate. Furnace designs cor- porating special atmospheres and even vacuum are under consideration. Titanium is quite sensitive to pickup of gaseous elements and the reducing atmospheres so admirably suited to steel and other nonferrous metals cannot be used. Cleaning methods to remove scale formed in heating, which have been used on common metals, are unsuited and cause damage to titanium. New techniques of operation and entirely different pickling and descaling media are required.

Statistical quality control hase been employed to control the production process. Tests are made in every stage of manufacture and plotted to indicate any change in quality as the material flows through the different steps. Statistics are used to correlate and analyze the results of testing and to indicate where improvements are required and if changes should be made.

From an address given at the Mallory-Sharon Editor's Day Symposium, March 8, 1955.

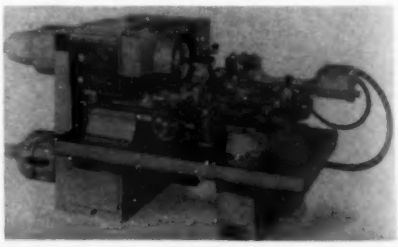
▼ ▼ ▼

Role of the Industrial Designer

By Robert H. Hose
Partner
Henry Dreyfuss
4 West 8th St.
New York, N. Y.

The industrial designer serves industry in a manner similar to the architect in the construction field. He is primarily charged with the responsibility of factors relating to structural appearance, safety, convenience, utility and maintenance of products if they are related to human beings. All of these objectives are directed ultimately towards the consumer.

The first problem the designer encounters is that of defining the problem



Elements of utility and safety are uppermost considerations in design of machine tools.

to be solved. Engineering, sales and management groups must together explain to him their general objectives so he will understand the limitations and the over-all goal.

Next, the designer is confronted with the development phase of the project. To him, this means a detailed study of requirements. This type of work must be done by the designer and his staff in their design office. It is up to the designer to evolve a theme and to refine each and every detail to be a consistent part of that theme in a practical sense.

Color is important on consumer products. The cover of the thermostat can be painted to match the wall.

The final stage of design might be considered the presentation stage. When engineering and industrial design groups have resolved the problems to their mutual satisfaction, the design is then presented to top level management and sales people as a production reality that can be accomplished for a known price.

One of the important considerations of industrial design relates to "human engineering." Physical safety is one of the things to be stressed whether the object is a typewriter key or a turret lathe control. Average proportions and dimensions of the human body are the base of many design concepts.

Any type of product which is used by people is only as good as the integration of the product with people. Good human engineering practice also takes into consideration one often overlooked factor of comfort. Another man-machine relationship is that of ease of maintenance. Lubrication of equipment, shifting drive pulley on a turret lathe, etc. are maintenance. Such things should be easy to accomplish so as not to interrupt time of the user unduly or inconvenience him.

Another consideration is cost as relates to tooling, manufacturing and distribution. Without being specialists in cost, industrial designers frequently can suggest ways and means of simplifying cost structure or merchandising and guide programs in such a way that cost problems are intelligently and practically met.

Another point is merchandising appeal of a product. Public acceptance, whether from point of view of over the counter item or the user of a heavy machine tool is of equal importance.

Related to this is the factor of appearance. The designer must add his knowledge of form, line, proportion and color to the work he is doing in order to refine these psychological qualities which in the user's or purchaser's mind mean quality and character. It would be absurd to streamline an object which did not move. The high color taste required on consumer products for the home would be out of place in a factory, but there is a fine common denominator logic in applied reasoning available which means that each and every product can have its own, and should have its own, distinct character.

From a paper given at the 12th Machine Design Conference of Cleveland Engineering Society, Feb. 1955.

A Practical System of Preventive Maintenance

By Lewis P. Randall, Jr.
Sr. Electrical Engineer
Ternstedt Div., GMC
Trenton, N. J.

Preventive maintenance is a system in which equipment is inspected, tested and reconditioned at regular intervals to prevent failure in service and to retard deterioration. The interval is set on the basis of experience, character of equipment, service conditions and its importance in the production process. The need for preventive maintenance became apparent particularly in the die-cast department during reconversion from wartime production. In this department, down time was reduced from 14 percent in 1947 to less than 1 percent in 1949. As a result, the program was extended to cover the entire plant.

To be effective a preventive maintenance program must be operated by an efficient, thorough and economical system. Three categories included in such a system are: schedules, job instruction sheets and records.

There should be at least two types of schedules for a system. One in book form lists the equipment to be inspected, location and date of inspection. Second, a card schedule is kept in a master file and maintained by the person issuing the inspection sheets. Job instruction sheets are used to instruct the mechanic on the job as to extent of inspection and procedure to follow while performing the inspection. To make up initial inspection sheets, information may be obtained from a number of sources, such as manufacturers' recommendations, past maintenance experience with the machine, visual inspection, and operating complaints. While the first instruction sheet may be far from ideal, through constant review they can be revised to more suitable form.

The purpose of records in a maintenance system is to provide a tool for checking effectiveness of a system and making necessary improvements. Machine performance can be improved, down time reduced, life of parts of equipment can be determined and replacements ordered as required.

Records should contain information gathered during inspections and a record of all machine breakdowns, plus any miscellaneous repairs not covered by the inspection or breakdown. Records should be kept in a permanent file in either the maintenance department or plant engineering. They should be readily available to all authorized personnel and should contain a maximum amount of information concerning not only machine performance, but also data covering machine components such as belts, motors, heating element, and bearings. A report of down time is used by the preventive maintenance engineer, together with inspection reports to adjust inspection schedules, improve and recommend replacement of machines where indicated.

There are many advantages resulting from preventive maintenance. From the viewpoint of production personnel, breakdowns are reduced, bottlenecks eliminated and down time generally minimized. This results in improved morale. From management's viewpoints, costs can be more accurately determined and tend to become more uniform. There are fewer emergency breakdowns and it is easier to meet production requirements.

Experience has demonstrated the cost saving possibilities of an effective preventive maintenance program. No one program will fit all plants. Each type of operation requires modification of the basic program. However, management, production and maintenance, must be sold to be effective.

DOWN TIME RECORD

DESC. Bender - Pneumatic Elliptical
EQ. NO. S-8 DEPT. 5 COL. U-22

DATE & TIME DOWN	DATE & TIME RUNNING	TOTAL TIME DOWN	EST. COST PRODUCTION LOSS	REASON FOR DOWN TIME
2-4-55 8:00	2-4-55 10:00	2	4	Clutch slips
2-9-55 3:00	2-10-55 7:00	15	60	Broken gear
2-22-55 7:30	2-22-55 9:30	2	8	Broken V belt

Down time record helps assess effectiveness of maintenance system.

From a paper "A Preventive Maintenance System and Its Operation" given at the Machine Tool Conference, AIEE, Oct. 25-27, 1954, Detroit, Mich.

BECAUSE *Lusol* IS *DIFFERENT...* WE DARE SUGGEST A SHOP-WIDE TEST!

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YOUR BENEFITS—Superior heat dissipation means that your present equipment can be worked harder, yet your men find things easier—higher speeds and feeds, with less downtime for sharpening tools, finer finishes and closer tolerances. Improved working conditions result in better morale among your employees.

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We'll have a Lusol field engineer call and arrange to run the test in your own plant.

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F. E. Anderson Oil Co., Inc., Box 213, Portland, Connecticut

☐ Send me the leaflet, "Case Histories of Lusol at Work" and any other data.

Name_____ Title_____

Company_____

Address_____

☐ Have your man call to discuss arrangements for installing Lusol All-Chemical Coolant in the machines selected for this test. ( )

Giving Organization Meaning

By John R. Sargent, Partner
Cresap, McCormick and Paget
New York, N. Y.

Organization is the division of labor among people to achieve a given objective. All principles of organization relate back to this fundamental concept.

The three basic patterns of organization are: functional, product, and regional. In manufacturing a limited number of kinds of products, the company's activities can be rather simply organized on the basis of sales, production, engineering and financial functions as they apply to all products. Where there are a large number of products, or where groups of products are unrelated from a manufacturing or marketing standpoints, the functional type of organization is generally inappropriate.

In the product type of organization, in addition to a functional staff group, the company is basically organized into operating divisions and subsidiaries. Thus, in a large automotive firm, there is a car and truck group, a body group, an accessory group, and many other similar product divisions and subsidiaries.

A third or regional form of organization is one in which the basic activities are assigned to divisions on a regional basis. This form is most appropriate where operations are scattered geographically.

With this brief background on the forms of organization, what are the principles that determine for any given company what the form should be and how the organization mechanism should work? There are 13 key principles of organization planning which can be grouped or classified under three headings:

1. Definition of company objectives. The key principle is that every organization or principle element of it should have a clearly understood objective or objectives.

2. Definition of individual and group responsibilities and authority. The duties and responsibilities of all members of the organization should be clearly defined. Authority should also be clearly defined and be commensurate with assigned duties and responsibilities. Every function es-

sential to the given objective should be represented in the organization. Authority to act should be delegated to the lowest practical organizational level. Top management should be freed from burdensome detail. Duplicating, overlapping and conflicting functions should be eliminated.

3. Definition of reporting relationships. Each person should know to whom he reports and who reports to him. No person should report to more than one supervisor. An excessive number of persons should not report directly to any supervisor. Related functions should be grouped together; unrelated functions should be separated. Overelaborate organizations should be avoided. Consistent patterns of organization should be followed at all levels.

In discussing organization, the question always comes up whether an organization should be planned according to peculiarities of individuals in a given company, or whether the plan should be made irrespective of individual characteristics. Actually, it is impractical and unrealistic to attempt to do either rigidly. The best course is a compromise, but with the ideal in mind.

Committees have often been criticized as symptomatic of poor organization. A committee cannot supplant an executive position. They should only be brought into being as a part of the organization plan when there is need to obtain coordinated best judgment of a group of management.

Technical, scientific knowledge alone is insufficient for those who would fill top executive slots today. The ideal qualification for top executive positions in industry is a combination of both technical and organization skills. With the constantly advancing complexity of business and industry, opportunities available for individuals with such balanced qualifications are going to grow tremendously in the years to come.

From a paper given before the annual meeting of the AICE, December 1954.

▼ ▼ ▼

Integrating Cranes into Automation Lines

By L. S. Martz

Technical Consultant
Northern Engineering Works
Detroit, Mich.

In many plants overhead driving cranes are more than mere handling devices, and have become integral tools of production equipment on which entire departments are dependent for their rate of production. They are a part of any automation of such plants. An example is a metalworking company with a rather diversified line of fabricated steel products, highly productive, but manufacturing everything from small welded parts for the automotive industry to heavy sections for dams. Material handling in this type of plant is synonymous with production.

The cumulative handicaps of an old-time plant, which no longer fit the size and scope of its operations, dictate the construction of a new plant. It is apparent that the handling of material and equipment will determine not only the layout of the plant but the design of the building.

Many factors determine building areas. Much material is received in

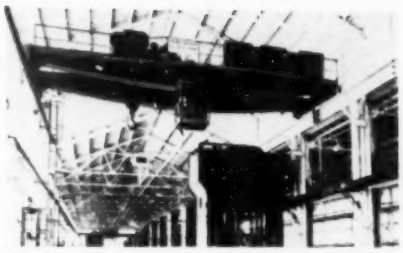


Fig. 1. Increased bay width simplifies handling and gives higher percentage of usable area.

long lengths and requires a large handling area. Fabricating equipment such as shears or presses is large and requires large working areas. Many assemblies become bulky and spread out over wide floor areas. Every foot of floor space must be productively used if possible. Only floor space provided with overhead crane service can

be highly productive.

First thinking may be based on 60-foot wide buildings because of past experience. But there is a marked advantage in the tread toward wider, clear span areas. Material handling is simplified and more useful building area with greater flexibility for future requirements is provided, *Fig.* 1.

Building height is also of extreme importance. Requirements for handling maximum size materials and how high they must be lifted, must be determined for each section of the plant. Maximum heights of presses must be determined and allowance made so that crane girders will clear them. Future requirements of processes, products or equipment must also be considered.

Other factors, such as runway capacities, crane capacities, operating speeds, current, floor or cab control, and number of cranes per runway must be considered. These items should be compared with possible savings in cumulative costs in waiting for crane service, increased production profit, insurance against down time and reduced maintenance costs.

Determining operating characteristics on the basis of these fundamental factors will lead to proper selection of crane equipment. From such studies and research a new philosophy can be formulated about overhead material handling equipment. This must soon experience a similar evolution to the machine tool industry. For a long time machine tools were designed and sold for general purpose use, with a minimum of twenty years assumed for amortization. Because of more competitive production in high-production industries with shorter write-offs and recovery periods, the trend in machine tools is now toward special-purpose design and use.

From a paper presented at the Materials Handling Conference sponsored by the Westinghouse Electric Corp., Columbus, O., Feb. 1955

▼ ▼ ▼

Properties and Uses of Vinyl Plastics

By M. Virginia Sink

Chrysler Corp.
Detroit, Mich.

Vinyl plastics are indeed unusual materials with a variety of properties and uses. One is a sponge-like material, another, a sheet of clear flexible material and another, a solid—all from the same family of compounds. Properties of this material can be altered by changes in composition much as properties of a piece of steel can be varied by its alloying constituents. Ingredients of the material include the basic vinyl resin, a plasticizer (if a flexible product is desired) stabilizers, lubricants, colorants and fillers.

Proper care and engineering knowledge must be used in designing a vinyl for a particular application. For instance, varying the amount of a plasticizer can produce a product which is soft and flexible or one which is hard and rigid. The plasticizer promotes rubber-like characteristics by separating the vinyl chains and reducing intermolecular forces, thereby allowing the chains to move over each other more freely. Vinyls can be manufactured into finished products in numerous ways: extrusions, sheets, compression molds, injection molds and as adhesives, coatings, filaments and films. They can be made into foam products and impregnated with many materials.

These materials lend themselves to mass production or continuous operations. Their properties include complete color range in both opaque and translucent effects and also good light transmission. They have excellent electrical properties accompanied by toughness

and flexibility. Another attribute is lightness compared with other materials. Durability is outstanding. They soften at temperatures low enough for easy manipulation but high enough to maintain rigidity at working temperature.

They can be as transparent as glass yet not brittle. They are tough and can be made highly elastic like rubber. They can be made to resemble leather and will not rot. These virtues can be used to best advantage when articles and structures are specifically designed for each type of vinyl, since all desirable characteristics may not be present in any one plastic for a particular purpose. Each material has one or more outstanding feature. The many automotive applications include rear curtain windows for convertibles. This allows a larger window, improved styling, more light and better vision. Flexibility of the material permits the window to fold easily into the well at the rear when the top is down. First, it was tested for summer heat, sub-zero temperatures, tearing resistance, abrasion resistance, aging and other qualities.

Another application, using optical properties, is in laminated safety glass. Glass made with vinyl has been found to be better in many respects than previous laminating materials. Sponge-like vinyls are used by styling for complex curvatures of arm rests. A new technique of production was required for the foam and plastisol skin shown in

Arm rest of vinyl foam with plastisol skin. Cross section (bottom) shows excellent bonding.

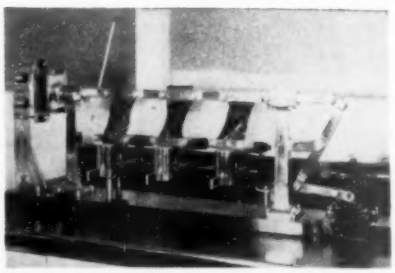
accompanying photo. Arm rest made of this material is a textured appearance, molded in one step which saves assembly time and allows design freedom greater than possible with fabric-covered sponge rubber. It also can be made in a color to match interior scheme of the car.

Another application is for the electric wiring insulation where they meet exacting conditions. Another unusual

use is as a coating on the steering wheel. Vinyl-coated fabrics, of course, have come into wide use because of resistance to abrading, scuffing and marring. They do not have objectionable aging and oxidizing characteristics. They are equally adaptable to being patterned, grained or pigmented. These various qualities are tested before application. One typical test is that for flexing shown in the accompanying illustration. Artificial tests are valuable for giving accelerated results and indicating relative merits for gaging. Samples, for example, are exposed to an arc light and checked for changes every 24 hours. In such a test, they must remain unchanged for 200 hours to be considered satisfactory.

Accumulated data indicates that vinyl-coated fabrics are superior to many other types of coated materials. Their advantages include the following combination of qualities:

Durability under severe usage
Ability to withstand discoloration
Freedom from exuding oil or other substances
Ease of care and maintenance



Flexing equipment for testing coated fabrics. Weights on attached lever apply tension to the specimen.

Fire resistance
Resistance to abrasion, cracking and peeling in extremes of weather

An interesting recent development of coated fabrics is the breather pattern. Porous vinyl-coated fabric so produced overcomes original disadvantages of the feel of the material and the fact that it appeared to become sticky from perspiration in summer. Other new developments include backing materials for door panels, coating for rubber floormats, window stripping materials and the like. Such developments require combined efforts of engineer, chemist, and stylist, as well as chemical suppliers who have developed materials such as this to make new products possible.

From a paper, "Materials Unlimited," presented March 30, 1955 at joint session of Engineering Society of Detroit and Detroit Section of Society of Women Engineers, Detroit, Mich.

Pressworking of Metals

By W. S. Wagner
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E. W. Bliss Co.
Canton, O.

Stamping, forging, extruding and other metalworking industries are interested primarily in the relatively large plastic changes which are required in creation of new permanent forms. These changes in form may be accomplished either hot or cold with materials that are either isotropic or anisotropic.

Among engineers and designers there seems to be some misunderstanding of the phenomena of plastic range. In the design of structures and machines the yield point may be used as the criterion of failure of a structural or mechanical member; however, many people seem to believe that a material is utterly useless and destroyed if it has been stressed beyond its yield point. This belief, of course, is

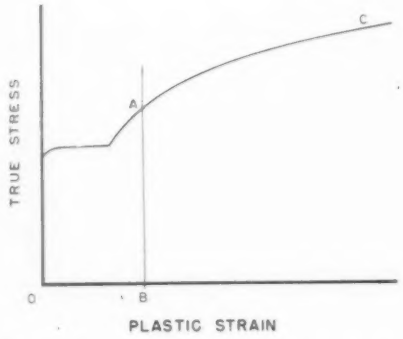


Fig. 1. General curve of true-stress and plastic strain.

definitely untrue. On the contrary, for production purposes the opposite is more nearly valid. Most metals after once having been stressed beyond their yield points have greater resistance to deformation than they had prior to such treatment. The plastic phenomena make possible many methods and processes for producing specific forms and also specific physical properties of materials that could not be obtained with any other process.

There are two important states of plasticity in metals—the thermoplastic range and the crystoplastic range. The thermoplastic range occurs above the recrystallization temperature where crystal structure is unstable. It is also known as the forging range or hot-work range. The lead and tin are in this range at room temperature and zinc, magnesium and aluminum at slightly higher temperatures.

This is an important factor in thermoplastic working. Residual work-hardening is responsible for improved physicals in forged products. The crystoplastic range is below the recrystallization temperature where the crystal structure is in a stable equilibrium. It is known as the cold-work range. In it plastic flow leaves permanently deformed crystals with their areas of relatively high energy at deformation planes.

Within the crystoplastic range there are further subdivisions. The middle embodies the majority of commercial forming operations. Its true stress-strain relationship can be sharply defined but these data have not been compiled except in a few specific instances. The separating point with the upper range has been roughly defined as the place at which all favorably oriented slip-planes have been used up. This range should be of major interest, but is difficult to investigate by current techniques.

The basic laws of plasticity are more complex than those of elasticity. When plastic strain increases beyond the greatest value that it has had previously, the true stress is a definite function of the plastic strain. A curve of stress and plastic strain may be plotted as shown in *Fig.* 1. When true stress and plastic strain have reached any point A on this curve, the material can be considered to be a new material. Point A then marks the elastic limit of this new material. The changes of a metal specimen from the annealed state through work-hardening and return to the original state by recrystallization at elevated temperatures is termed the plastic cycle. This must be understood to plan mass production operations adequately. Grain-growth studies and grain-size effects especially with respect to surface finish after forming requires study.

Industry needs a wide range of information on plastic working of metals in order to operate on a firm scientific basis. It needs specific true-stress physical data of the plastic-range properties of many metals. These data should be made available for all work tempers furnished, for actually each is a new material. Stress-relieving, annealing, and thermal-treatment practice should be well defined and explained. The fields of external friction and lubrication under extreme pressures should be explored and pertinent data compiled. A classification of metalworking operations, namely, rolling, extrusion, drawing, forging, punching, etc., should be made and each should be explained in light of applicable theory.

From a paper "Plastic Working of Metals" presented at the ASME annual meeting Dec. 1954.

Ultrasonic Testing of Small-Diameter Tubing

By W. L. Fleischmann

Materials Engineering
Knolls Atomic Power Lab.
General Electric Co.
Schenectady, N. Y.

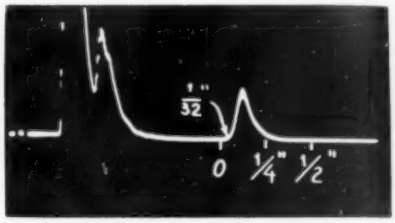
and

H. A. F. Rocha

Materials and Development Lab.
Large Steam Turbine-Generator Dept.
General Electric Co.
Schenectady, N. Y.

Tests for determining internal flaws in metals are being extended successfully with automatic ultrasonic recording equipment to the inspection of small-diameter tubing.

Among other possibilities the new method contributes to maximum safety in the construction of atomic power plants. The necessity for more stringent inspection than has been required by applicable ASTM specifications has been recognized in view of the serious consequences of failures attributable to material defects that cannot be detected in any other way. The removal of limitations on the method as applied to tubing will be of value for inspecting all tubing to be subjected to severe service conditions.



Reflectogram of defect located 1/32 inch from delayed shear-wave search unit.

A solution of one of the basic problems in applying the ultrasonic test method to small objects was attained by means of a delayed shear-wave search unit used with recording equipment, as indicated in the accompanying illustration.

Although the equipment was developed for acceptance tests of tubing, its greatest usefulness is believed to be as a quality-control tool in plants which produce tubing.

From a paper, "Testing of Small-Diameter Tubing with Automatic Recording Ultrasonic Equipment," presented at the ASME spring meeting, April 18-21, 1955, Baltimore, Md.

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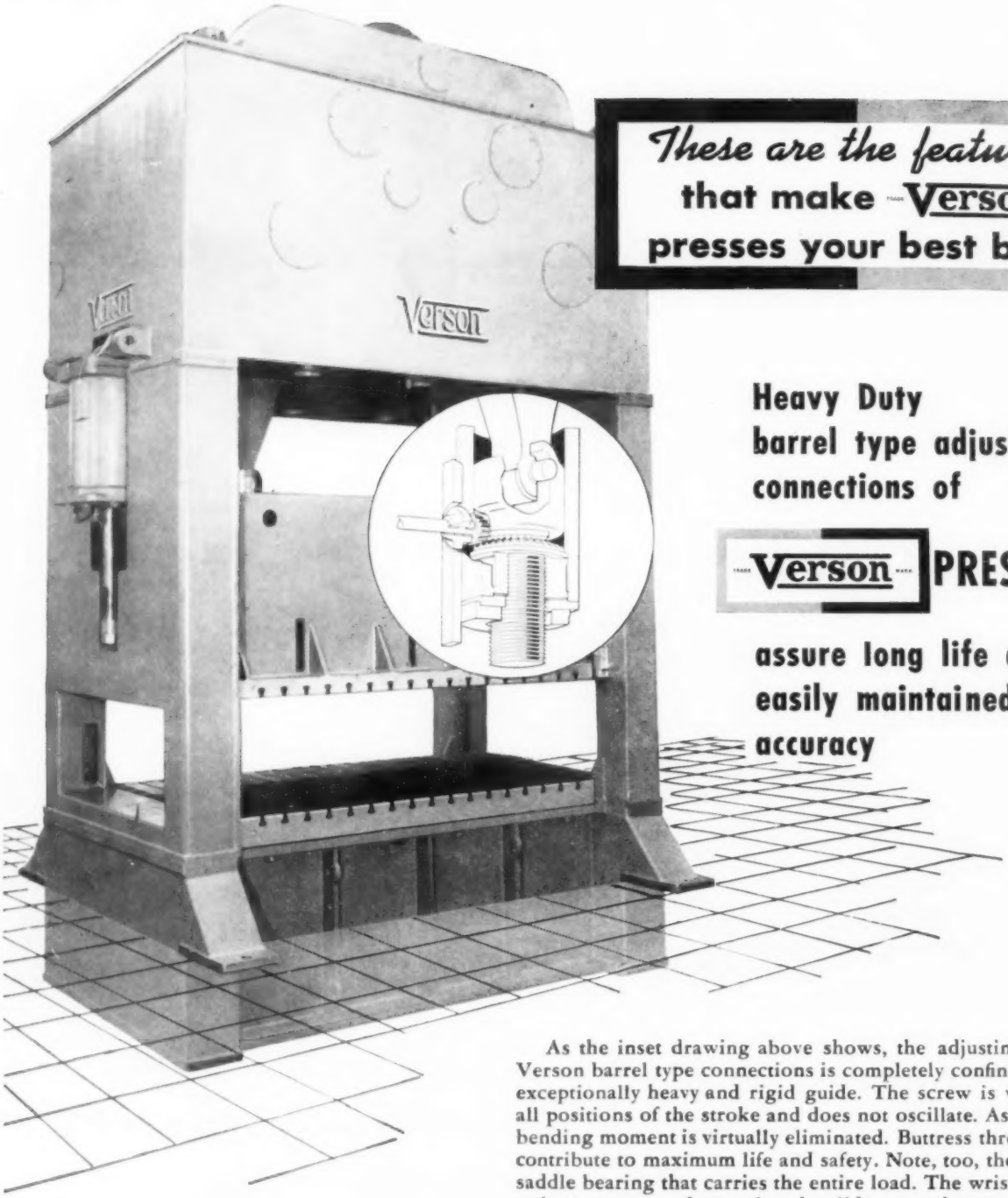

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As the inset drawing above shows, the adjusting screw of Verson barrel type connections is completely confined by an exceptionally heavy and rigid guide. The screw is vertical at all positions of the stroke and does not oscillate. As a result, bending moment is virtually eliminated. Buttress threads further contribute to maximum life and safety. Note, too, the heavy saddle bearing that carries the entire load. The wrist pin serves only as a means of returning the slide to stroke up position.

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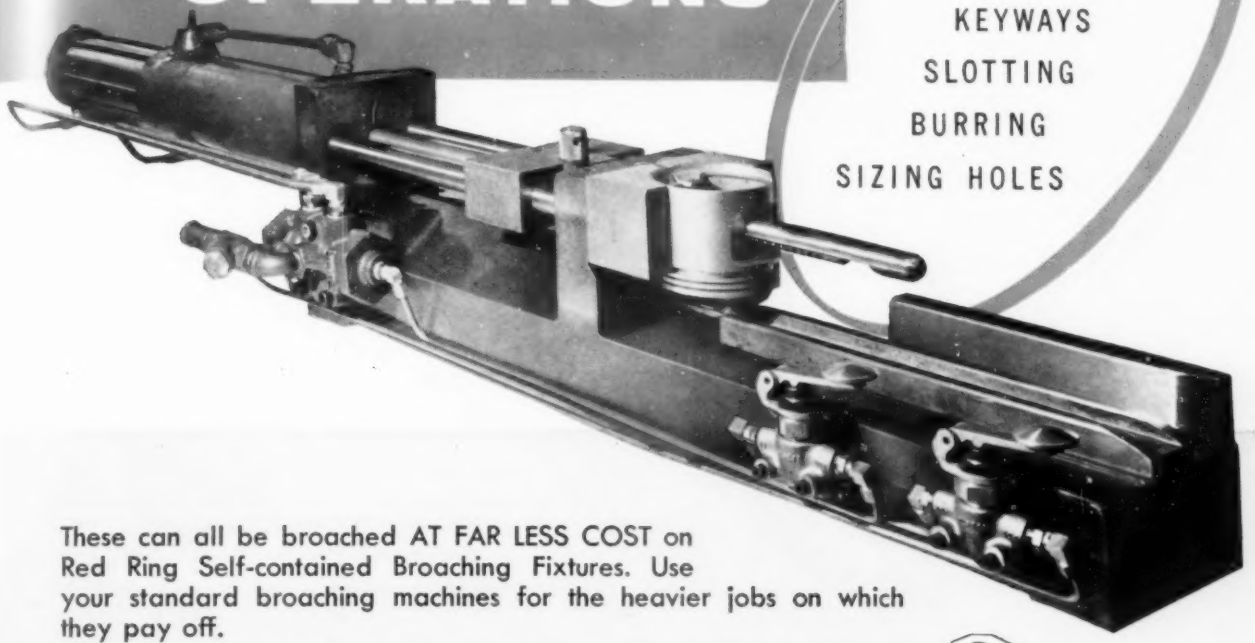

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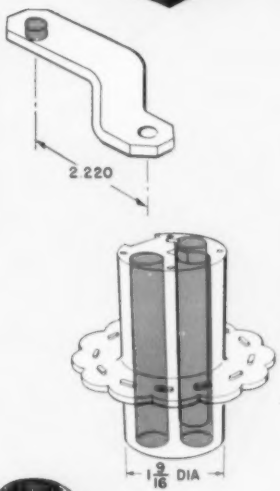

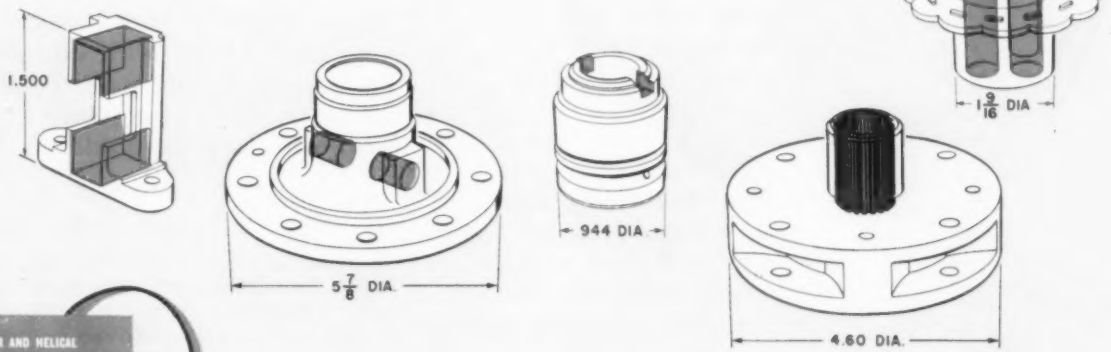

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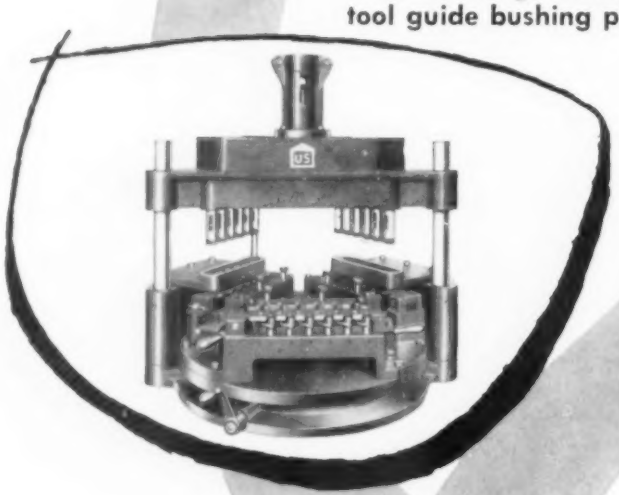

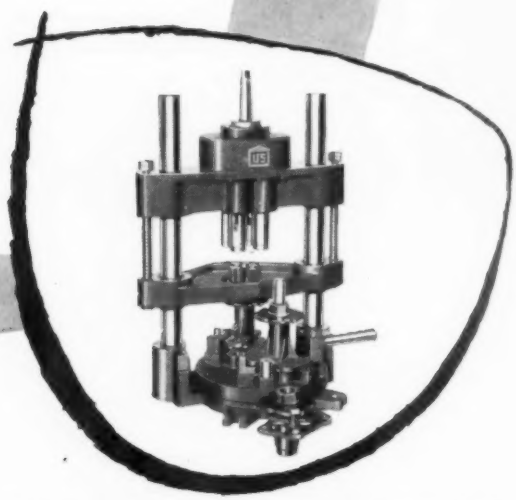

Shown above is a drill head complete with boring bars with Carboloy-tipped cutters and Stellite wear strips. The indexing table has necessary holding fixtures with bushing guide plate.

The setup, left, has a two-position, hand-indexed fixture.

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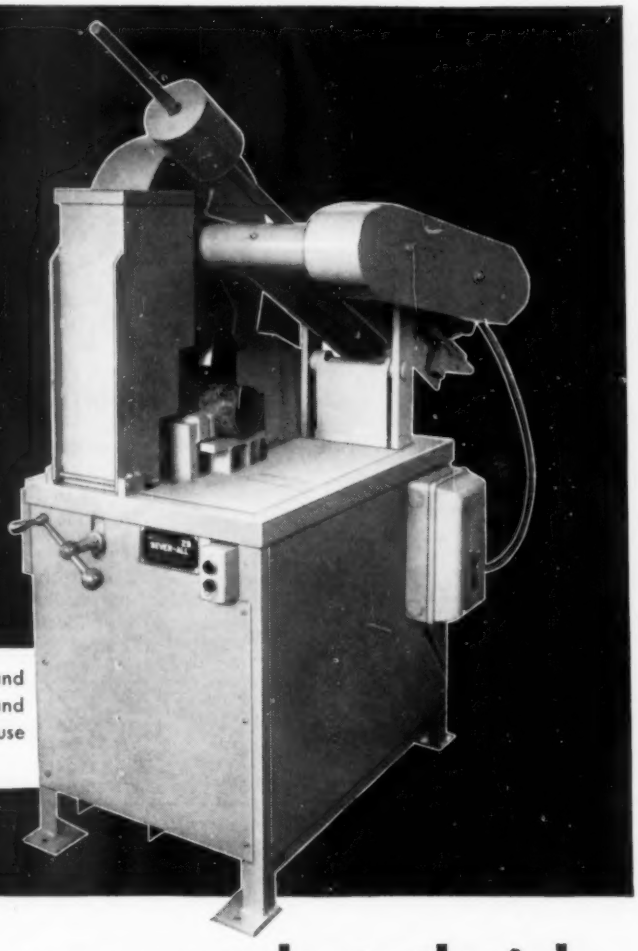
- Compact
- Portable
- Ideal for contract or construction work



CAPACITY: Solids up to 4" x 4" square, angles and channels to 8", tubes and pipes to 4" O.D., 4" angles and channels and 4" O.D. pipe at 45° angles. Based on use of 18" cutting wheel and 10 H.P. motor.

Here's a versatile cutter you can take to the job

• This new CAMPBELL Model 28 SEVER-ALL Abrasive Cutter is a dry-cutting machine which combines the capacity for a wide variety of cutting operations with a compactness which permits a portability seldom found in cutters of its type and capacity. It is ideal for cutting all types of material in contract or construction work. Can be supplied with work stop and with wheels for easy movement from job to job.

From front to back, the SEVER-ALL measures but 56". It is only 32" wide and 62" in height. Other important features include:

1. Work clamped on both sides of cut by hand-operated, self-centering work holders. Can be supplied with foot-operated treadle.

2. Time of cut is approximately 3 seconds per square inch of material.

3. Operator safety provided by complete enclosure of cutting wheel during operation—except for openings to clear the work.

4. Lowering of guard permits accurate location of work, permits long pieces to be placed in machine without threading through.

This Model 28 SEVER-ALL cutter is the newest of a long line of CAMPBELL Abrasive Cutters which provide many exclusive features. CAMPBELL field engineers are conveniently located to consult with you on ALL your cutting problems. Write today for specifications on the SEVER-ALL or **Bulletin DH-301** on the CAMPBELL Abrasive Cutting Method.

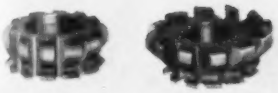
ACCO

Campbell Machine Division
AMERICAN CHAIN & CABLE

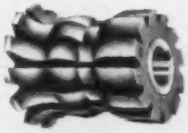
945 Connecticut Avenue, Bridgeport 2, Connecticut

Wet and Dry Cutters and Nibblers

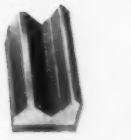
GROUND MULTIPLE THREAD MILLING CUTTERS



FORM RELIEVED MILLING CUTTERS



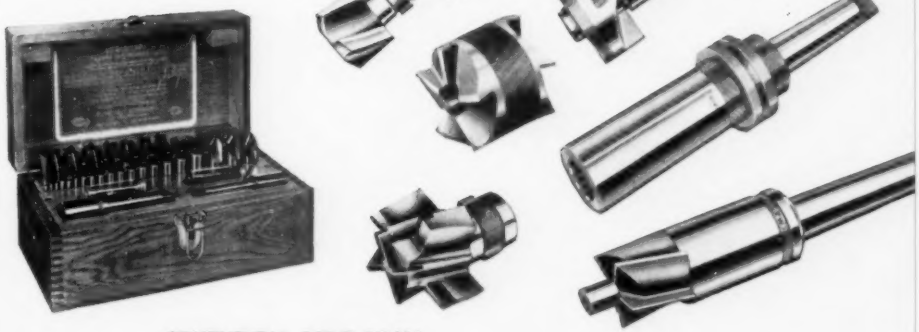
SINGLE POINT TOOLS



FORM TOOLS

BROACHES

FACE MILLS



CONTINENTAL DRIVE TOOLS

Why These Cutting Tools are

Production Proved

Continental is an Ex-Cell-O subsidiary.

As such, we are constantly trying out new tool designs, new methods, in Ex-Cell-O's big parts production shops.

There could be no finer "proving ground" for testing new materials and new methods. There are no finer cutting tools than "Production-Proved" tools by Continental.

Call in your Ex-Cell-O representative or contact Continental in Detroit for information about them.

CTW

Continental TOOL WORKS

Division of Ex-Cell-O Corporation, Detroit 32, Mich.

55-17

another new modern tap!

The new MODERN MS is a precision thread ground tap with adjustable chasers and available in five sizes ranging from $1\frac{5}{16}$" to $3\frac{1}{2}$".

THESE MS TAPS WILL SAVE YOU MONEY BECAUSE:

1. You do not lose size by regrinding and the chasers have a longer life than conventional non-adjustable taps.
2. Instead of buying new taps, you buy only chasers.

Bulletin M 130 tells the story. Mail this coupon today

modern tool works

CONSOLIDATED MACHINE TOOL COMPANY

ROCHESTER, NEW YORK

A DIVISION OF FARREL-BIRMINGHAM COMPANY, INC.

CONSOLIDATED MACHINE TOOL CO.
MODERN TOOL WORKS
565 Blossom Road, Rochester 10, N. Y.

Please send me without obligation your new Bulletin M-130 giving full information on Modern MS Solid Taps.

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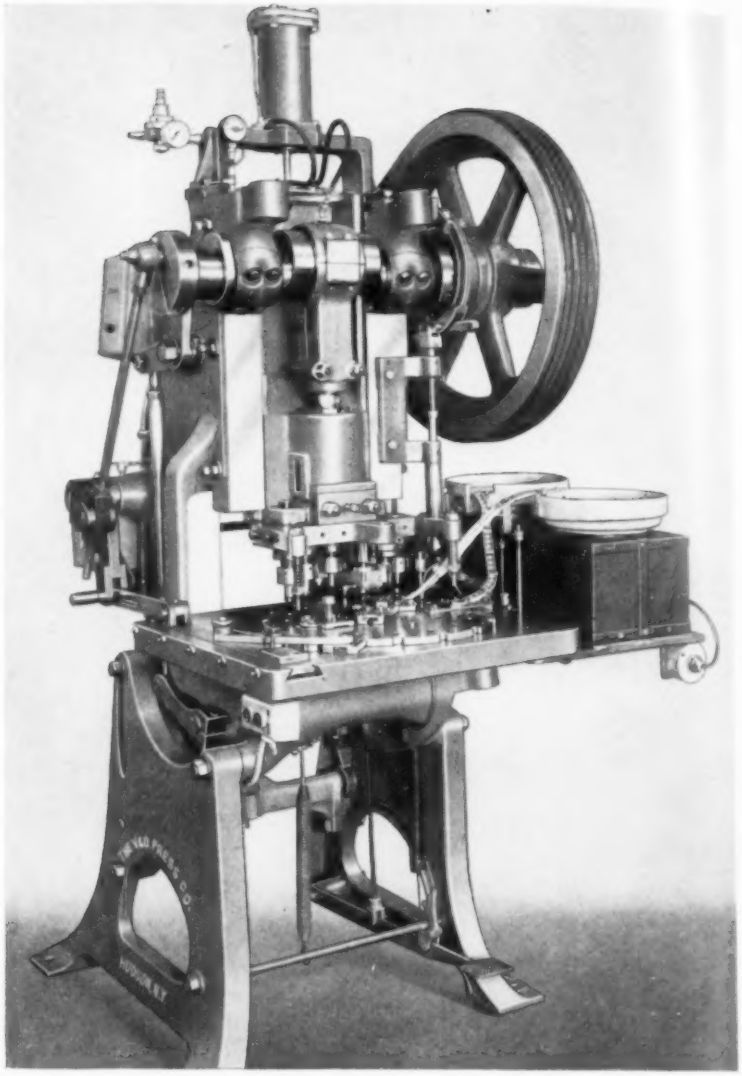
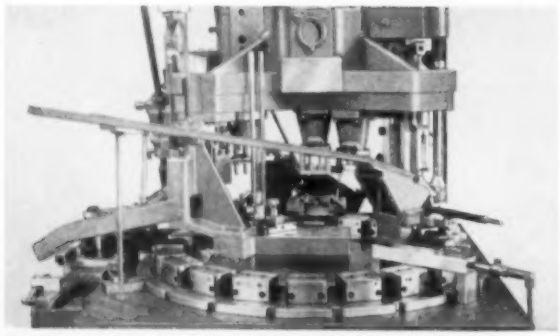
Complicated dies synchronized with hopper feeds require consistent accuracy — you're sure of it with V&O.

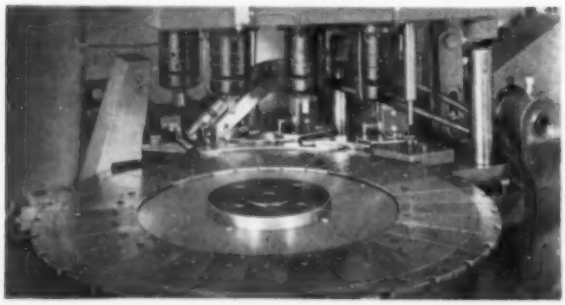
THE MORE INGENIOUS THE TOOLING THE MORE REASON TO GO V&O





Complex tooling like this needs V&O precision stroking . . . otherwise maintenance would be prohibitive.

Forming square nuts out of round stock requires sturdy, precise punch travel — you get it on a V&O.



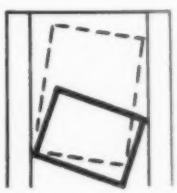
Complex tooling requires and deserves maximum press accuracy. That's why you'll find V & O's wherever ingenuity has demanded the support of precision press operation. Since they were first designed, V & O presses have been built like machine tools. Long slide precision stroking and hand-scraped ways in combination with all around sturdiness of construction assure dependable working accuracies day in and day out.

If you design your own tooling, make sure of optimum performance by putting it on a V & O press. If you have a special production problem that can be solved by automated, high precision tool motions and feeds, take it up with V & O.

Our representative will be glad to tell you more about the V & O presses and the engineering available for equipped production units. Write us, please.

WHY THE V&O LONG SLIDE PROVIDES BETTER ALIGNMENT

With the same running clearance, the longer the slide the less possibility for angular misalignment. And we keep our running clearances extremely close.



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Division of Emhart Mfg. Co.

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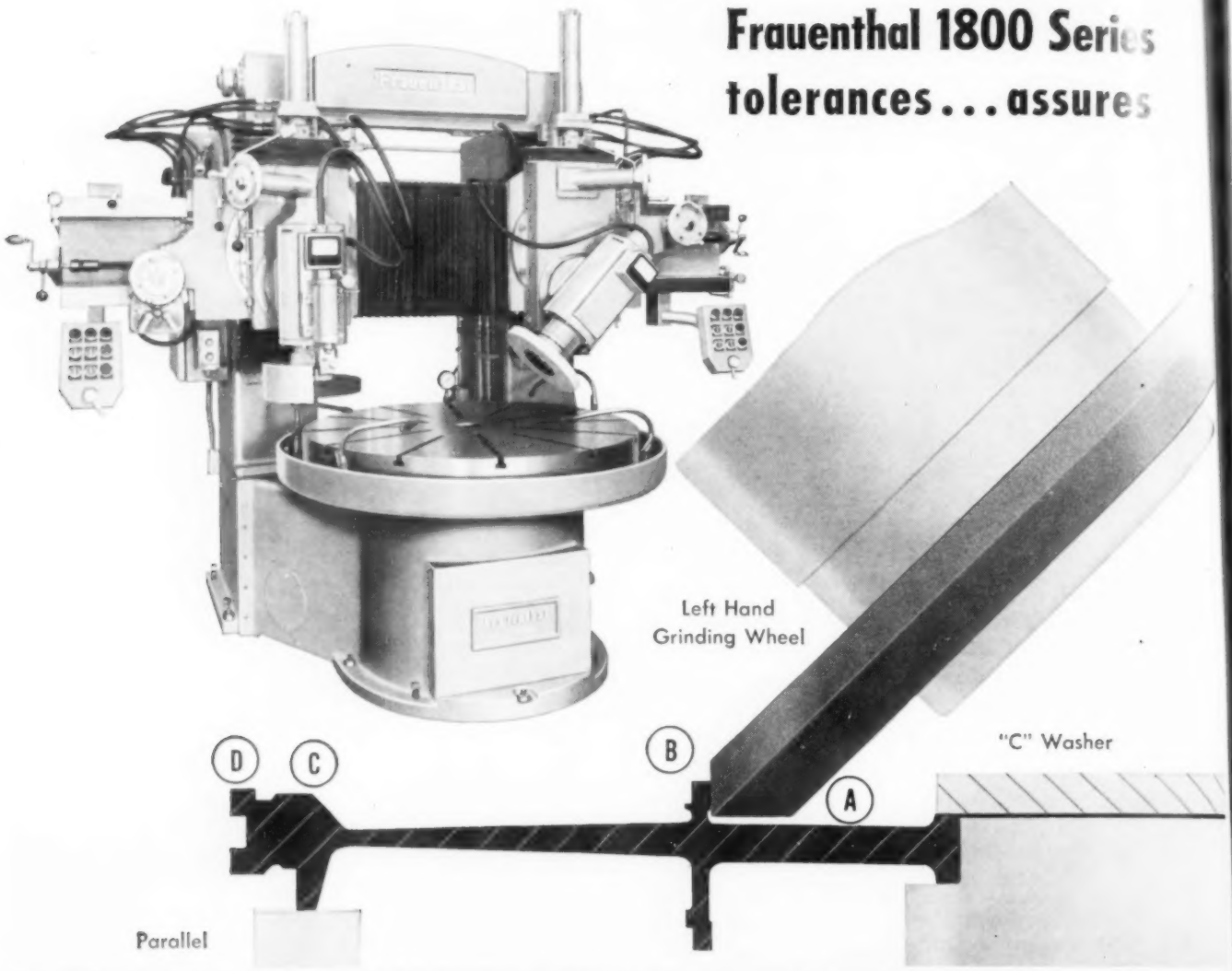
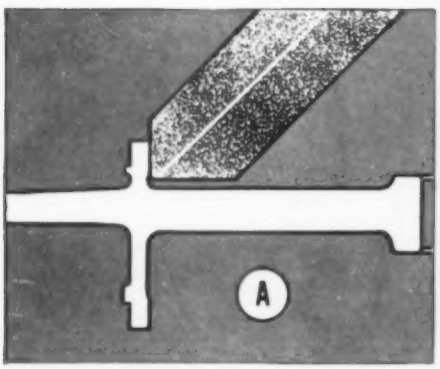
TE-6

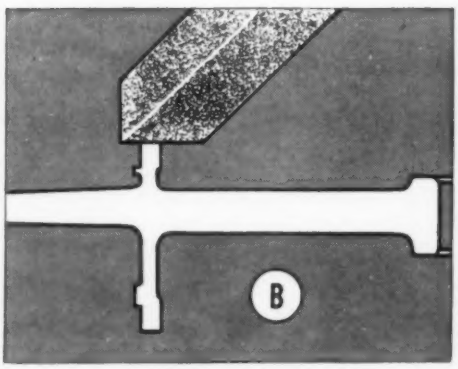
Multiple Grinding Operations

Frauenthal 1800 Series tolerances . . . assures

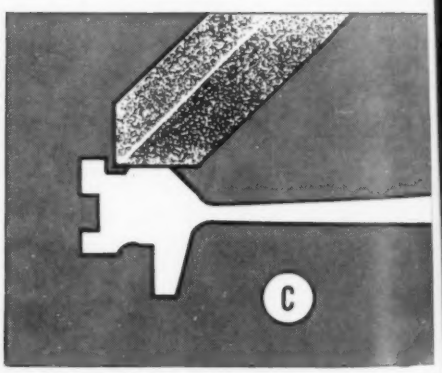




Jet engine part is set up on steel parallels and securely clamped to center pilot with large "C" washer.



Rigid mounting and proper alignment assures a high degree of accuracy in parallelism and roundness. Left hand



grinding wheel grinds one diameter and three related surfaces to extremely close tolerances.

Frauenthal Division

in One Set-Up

Double Head machine finish grinds 6 surfaces to close concentricity of related surfaces...reduces grinding costs

AS ILLUSTRATED in the schematic diagrams, three different diameters and three related surfaces of a jet engine component are precision-ground square and concentric with one another in a single setup using two grinding heads. This is a typical example of how a Frauenthal 1800 Series Double Head Grinder cuts grinding costs.

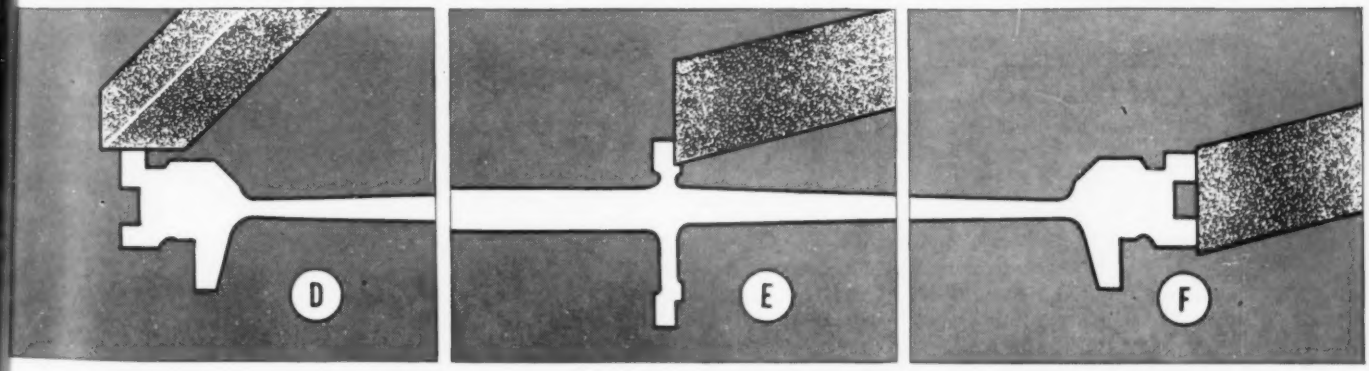
Frauenthal 1800 Series Grinders are available with four standard table sizes — 36", 42", 48" and 52" dia. with 60" maximum swing. Specially engineered operating features or job accessories can be included to fit your requirements.

With Frauenthal Grinders (1800 Series or 2200 Series) you're able to grind a number of related surfaces (up to 140" dia.) without changing setup of workpiece, and obtain accuracies within .000200". This assures you *consistently* uniform precision in concentricity, parallelism and roundness.

For complete details, contact Frauenthal of Muskegon.

Free Catalog!

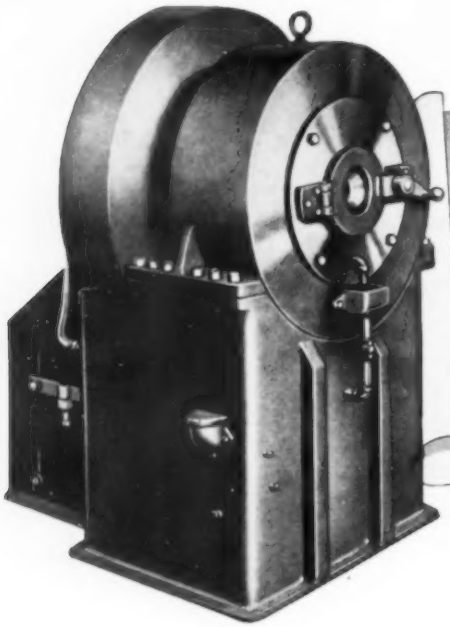
For complete details on Frauenthal 1800 Series Double Head Grinders, write for catalog.



Starting from center of workpiece it finish grinds INNER diameter "A", and TOP FACES "B", "C" and "D". Right hand grinding wheel finishes OUTER diameters "E" and "F". Both spindles are swiveled for accessibility to the workpiece surfaces. All surfaces of jet engine part are ground within .000200".

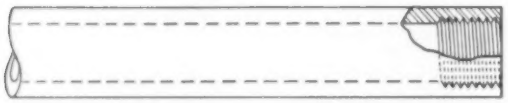
THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN

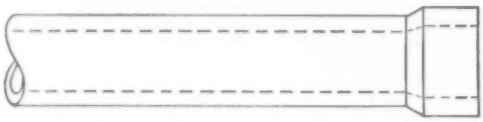


Swaging Success Stories

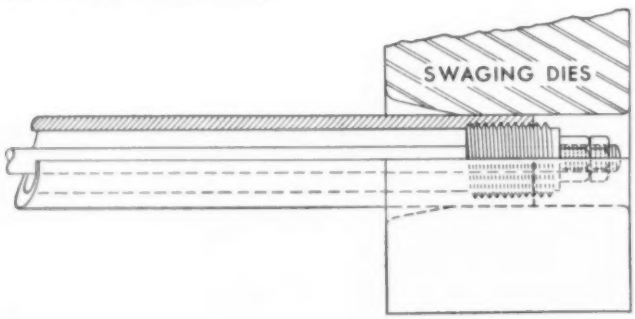
Forming Internal Threads ...by Swaging



The internal threads on this tube were formed quickly and economically by swaging over a mandrel.



First the end of the tube was expanded to receive a mandrel of the same diameter as the desired thread.



With the mandrel in place, the expanded section was then swaged to its original OD and the mandrel unscrewed. Result: Accurate internal threads with quality and finish of expensive machined threads. Uniformity from piece to piece was excellent.

Mandrel swaging can be used to form internal threads with practically all metals. It is particularly advantageous when working with aluminum and other metals that are difficult to machine.

Swaging can be your key to time and cost savings!

1. It's fast—often the fastest way to get a forming or finishing job done.

2. It's easy—can be done with unskilled labor.

3. It's economical—eliminates expensive machining operations without sacrificing quality.

Write for our informative booklet on swaging. It contains detailed descriptions of the Torrington Rotary Swagers. It also may carry the key to a "swaging success story" in your own plant.

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Swager Department
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Makers of Torrington Needle Bearings

TORRINGTON ROTARY SWAGING MACHINES

New

Series 90 Dyna-Shift

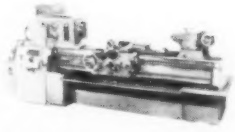
Metal-working

Don't miss the NMTBA's Machine Tool Show in Chicago—September 6 to 17 and don't, for better business' sake, miss our Monarch display there!

Object of the show, of course, is to demonstrate what the industry's best engineering brains have developed in the way of machines that lower costs by improving both output and accuracy.

Techniques—for

We'll be there, for instance, with a great many new lathe improvements, including two freshly announced this year. Those would be our new Series 90 Dyna-Shift Heavy Duty Lathe, plus the new Series 62 Preselector Dyna-Shift. So productive and so absolutely different as to defy comparison, they are two of many reasons why you cannot afford to miss *the world's best investment—in action.*



Series 62 Preselector Dyna-Shift

Business

We'll have more, too. And looking them over will be good for business—yours and ours, both. See you at the show! . . . . . THE MONARCH MACHINE TOOL COMPANY, SIDNEY, OHIO.

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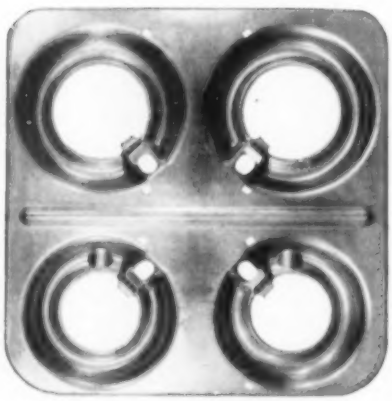

Vulcan, keeping pace with modern tooling, can recommend plastic tooling for medium production on numerous tool programs.

Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

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Our actual production figures prove plastic has a definite place in modern production.

Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

Our engineering staff will recommend the correct plastic material and advise if parts of your tooling program should be in plastic.

Send a part print and your production requirements for quotation and recommendations.

Major Vulcan Services . . . Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

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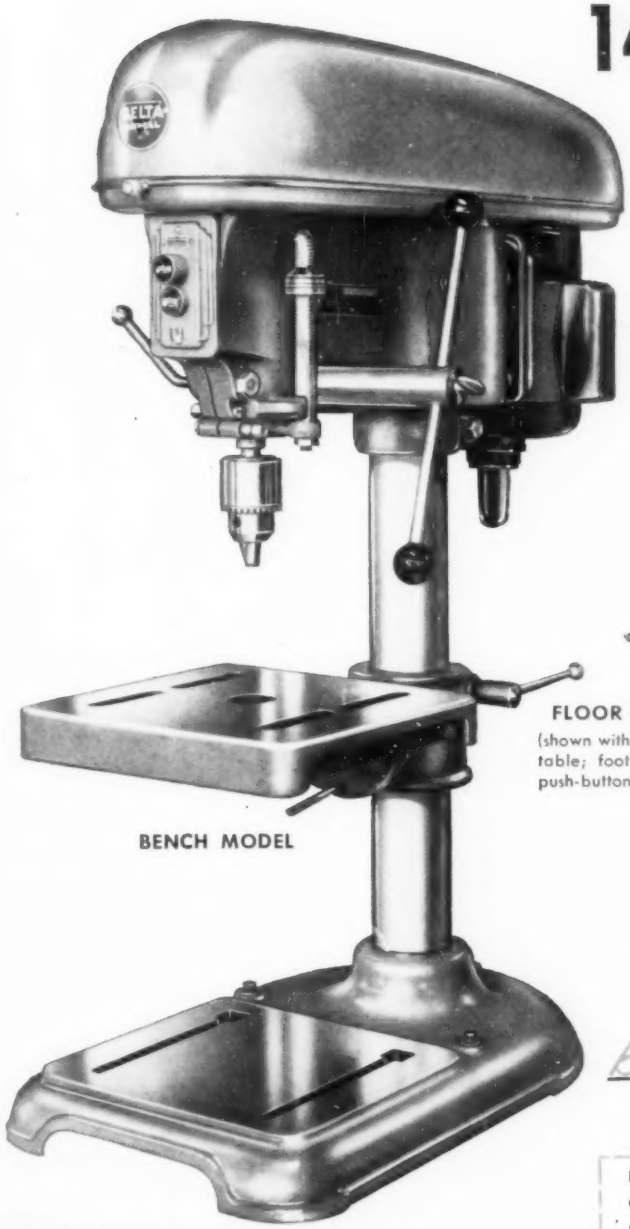
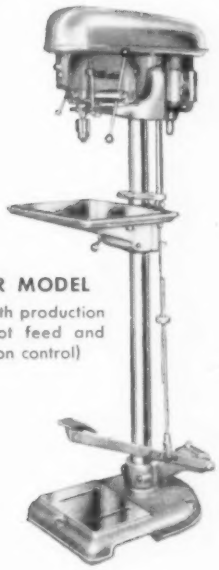
14" Drill Presses



BENCH MODEL

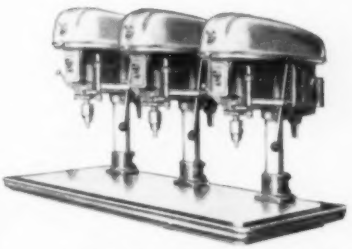


FLOOR MODEL
(shown with production table; foot feed and push-button control)

SEE THEM NOW!

A ten-minute demonstration will tell you more than ten thousand words about the great new DELTA 14" Drill Press line! See for yourself how eleven exciting new features increase accuracy and speed, decrease operator fatigue. See how the *low* Delta price gives you the biggest drill press value in history!

Let your Delta Dealer demonstrate the great new line of Delta 14" Drill Presses *now!* He's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY."



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ROCKWELL

DELTA QUALITY COSTS NO MORE

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• greater production
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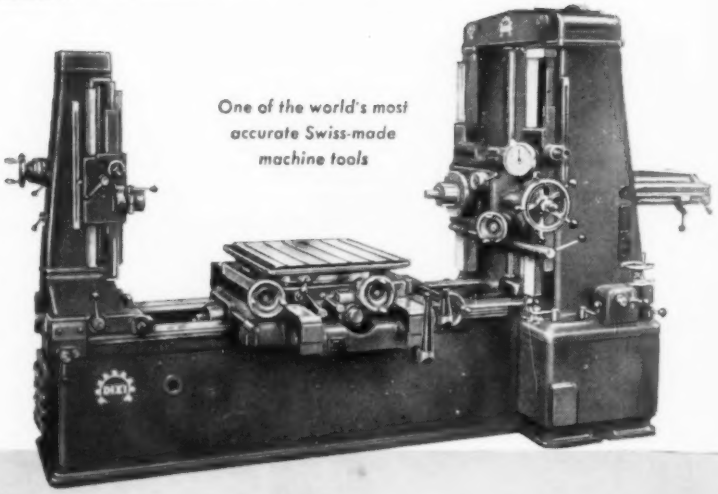
Dixi 60 Combination

Horizontal Boring Mill & Jig Borer

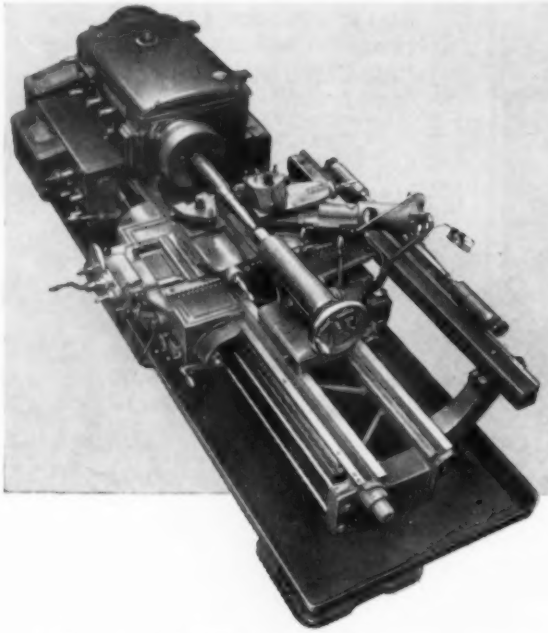
With 5 optical microscopes

A precision machine for boring, drilling, recessing, and milling work. Built-in rotary table with optical microscope can be rotated 360°. Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Table and spindle head have variable hydraulic feed. Mechanical spindle feed can be changed without stopping spindle and is provided with automatic depth stop.

No. 40 taper spindle. Spindle speeds 32-1350 R.P.M. Feeds .0015"—.010" per rev. Table size 28¾" x 32⅝" max. distance spindle to table 19¾". Table travel 23⅝". Spindle travel 24.4".



One of the world's most accurate Swiss-made machine tools



Heavy Duty Lathe *High Precision, Reliability, Top Performance Schaerer Model UN-450*

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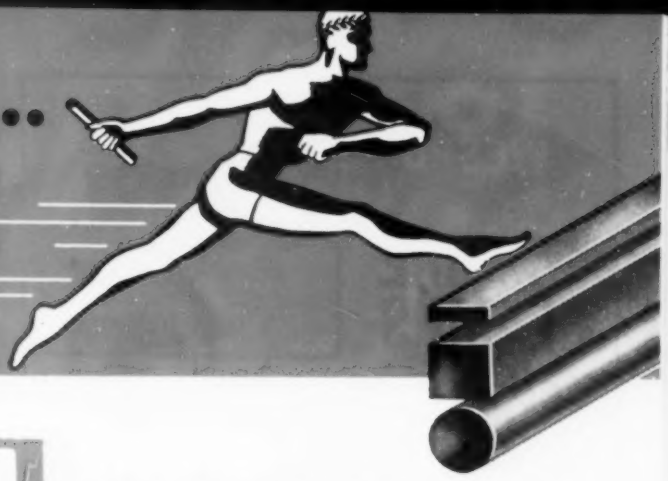
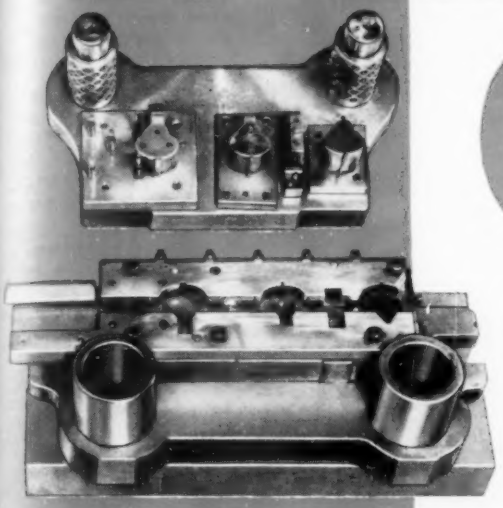
Lewyt Corp. says...

"for long run dies we prefer...



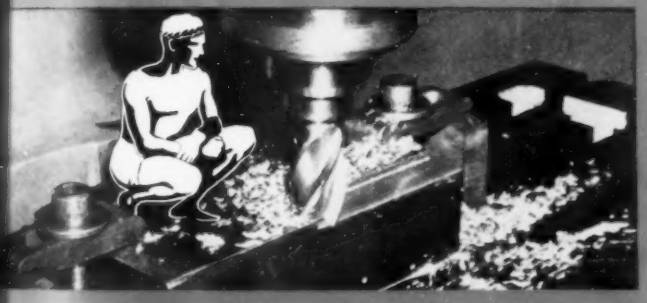
Olympic FM DIE STEEL"



● Olympic FM six-station progressive die with automatic feed—manufactures "damper cages" from .031 electro-galvanized cold rolled steel used in Lewyt Vacuum Cleaners.

Photos courtesy of Lewyt Corp. Brooklyn 11, N.Y.

Lewyt Corporation specifies Olympic FM because...



"... Olympic FM yields a superior machined finish ... does not tear."

"... Olympic FM machines much easier than other hi carbon-hi chrome steels ... increases tool life."

"... die performance is excellent."

Latrobe's new Olympic FM is a DESEGATIZED● High Carbon-High Chromium die steel which has given die makers improved machinability for thousands of long run tools and dies. Improved machinability is made possible through the addition of alloy sulphides uniformly dispersed by the DESEGATIZED● process of manufacture.

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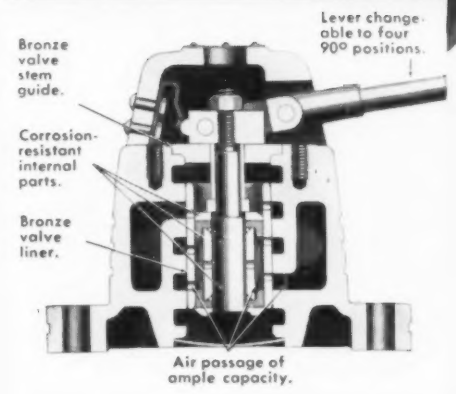

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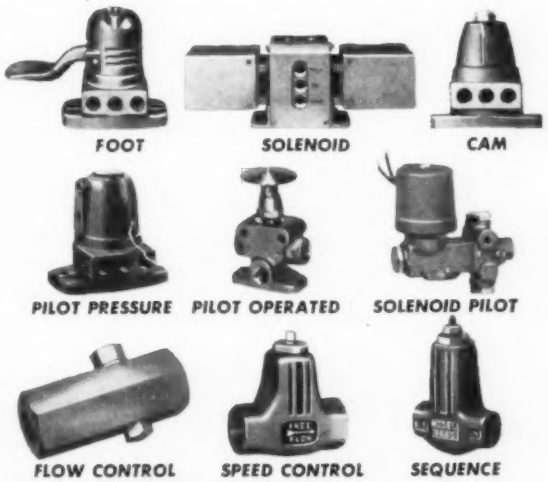

Be confident of the continuous, uniform control of air by using any of the complete line of Rivett Air Valves. Design assures easy operation, long life — precludes need of adjustment—prevents leakage. Readily disassembled for servicing or modification.

Recommended for pressures up to 150 P.S.I., these valves are available in 5 sizes: ¼", ⅜", ½", ¾" and 1".

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Working drawings, specifications, cut-away views —all data requisite to good circuit layout in these 12 fact-filled pages. Write for free copy today!

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Dept. TE-6, Brighton 35, Boston, Massachusetts

REPRESENTATIVES IN ALL PRINCIPAL CITIES

RIVETT furnishes a complete power package

AIR AND HYDRAULIC — VALVES, CYLINDERS, POWER UNITS

Member—National Fluid Power Association

Talking About Die Sets

WITH

PHIL MARSILIUS

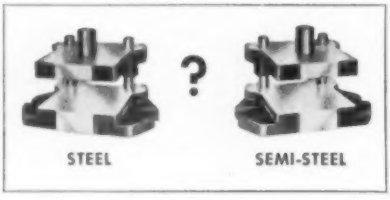
Vice-President
The Producto Machine Co.

Steel vs. Semi-Steel—What should your choice be when selecting a catalog die set? Quite often, the answer is a matter of dollars and cents. Naturally, you'd like to tool-up as inexpensively as possible but you must also be sure that an initial savings will not result in excessive replacement costs later on. In making a choice, the complete cost of tooling-up and maintenance during operation should be considered along the following lines:

Initial cost of either type;
Cost of machining either type;
Unit cost of die set per part produced;
Replacement cost in event of damage.

Taking each point individually, if two dies are identically made, except that one is mounted in a semi-steel die set and the other in a steel set:

The semi-steel set will cost less, machine easier, and have a lower cost per unit produced, if not replaced due to damage;



The steel set will cost more and require more machining time but may reduce the probability of breakage if excessive machining is performed on the die bed, and thus reduce the unit cost per part produced.

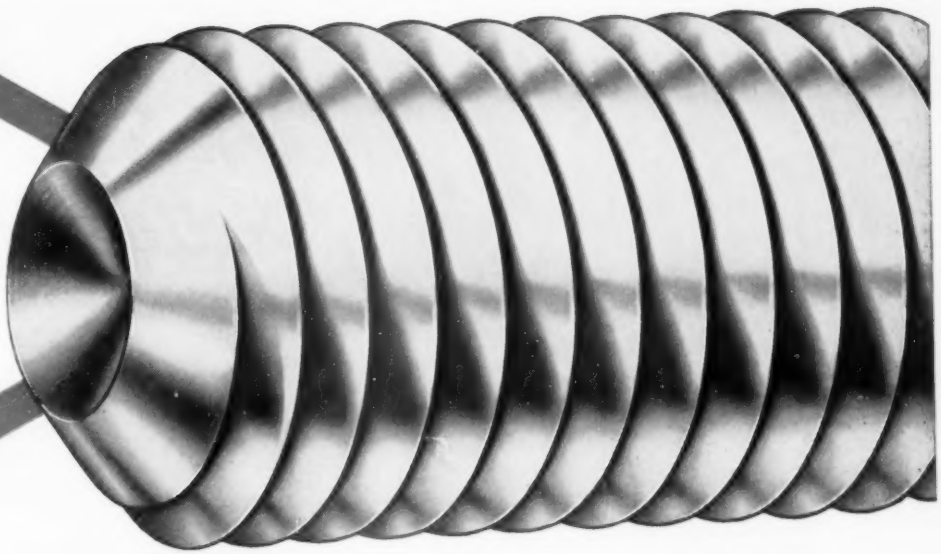
In general, for the average stamping operation, with all points considered, a semi-steel set is probably more economical. For heavy stamping operations, or for those that will run for a long time, a steel set would be the more practical. Either type can be purchased in the two grades of accuracy—Master-Precision and Commercial.

Where the advantages of a steel die set are desired and the savings of a semi-steel set are important, a combination of semi-steel punch holder and steel die holder offers an obvious, though seldom considered, solution.

Special Die Sets—When special die sets will have irregular contours, steps, bosses and other built-up sections or machined pockets, a set with these components integrally cast offers extensive savings in machining or fabricating costs.

ALLENPOINT SET SCREWS Proved 5 Ways Better

BY INDEPENDENT LABORATORY TESTS



Tested by a prominent independent laboratory against standard cup point and serrated point set screws, Allenpoint socket screws topped them all. In every test — carefully set up to simulate actual installations — Allenpoints outperformed and outlasted competing set screws.

BETTER *Cup Point Pattern*

Allenpoints make the all-important full circle pattern when tightened up to *ordinary* pressure — the normal force exerted to tighten a socket screw by hand.

BETTER *Resistance to Rotation*

Deep driven Allenpoints hold longer under increasing torsional strain than any other set screw tested.

BETTER *Cup Point Depth*

The deeper they drive the tighter they hold. Allenpoints — again at average wrenching pressure — penetrate smoothly and deeply with no gouging, no cutting action.

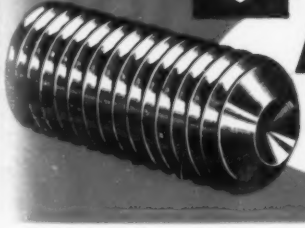
BETTER *Resistance to Longitudinal Thrust*

Tighten an Allenpoint held collar to a shaft with a wrenching pressure of only 150 inch pounds. It will take 1200 lbs. of longitudinal thrust to start that collar along the shaft. No pipe extension, no twisted wrenches to get effective tightening pressure. Allenpoints hold tightly at average *hand wrenching* pressure.

BETTER *at Withstanding Vibration*

Long after other set screws loosen their grip, Allenpoints hold firm under repeated vibration.

Write our Advertising Department for a detailed, technical brochure on these comparative tests. It's got the facts on the Allenpoint story.



ALLEN HEAD

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MANUFACTURING COMPANY
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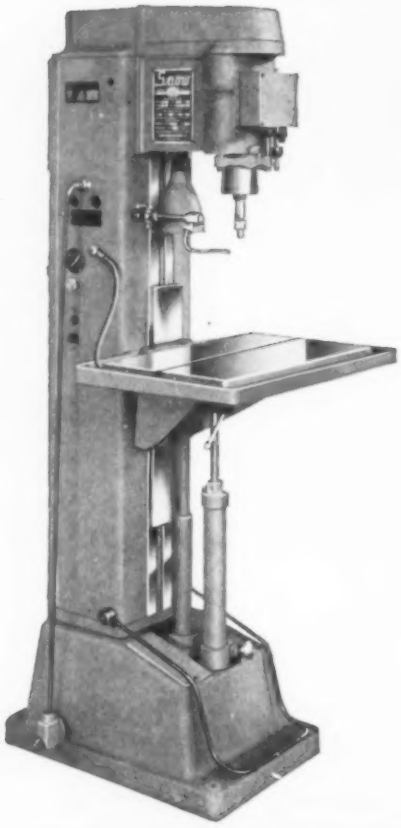
Sold Only Through Leading Industrial Distributors.

Specify Genuine Allenpoint Set Screws.

SNOW MANUFACTURING COMPANY

455 EASTERN AVENUE • BELLWOOD, ILLINOIS



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Electrically Operated—Air Controlled

. . . Drilling—TYPE "UD"

Capacities from #60 through 3/8" in two sizes

. . . Tapping—TYPE "UT"

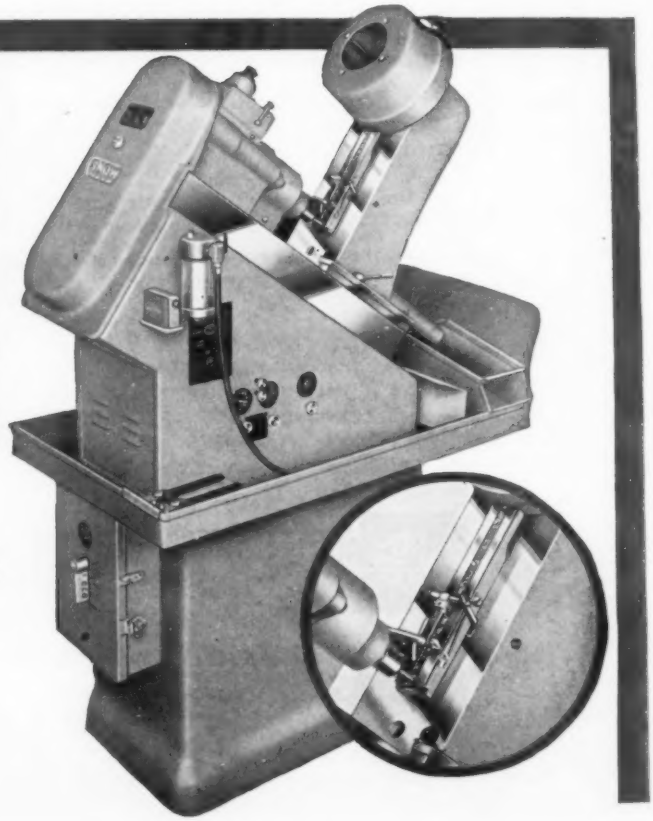
Capacities from #0 through 3/4" in four sizes

. . . Threading—TYPE "TR"

Capacities up to 1" in two sizes

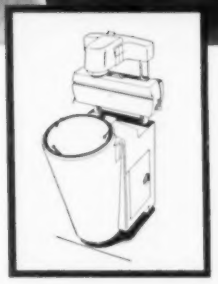
AUTOMATIC and SEMI-AUTOMATIC JIGS and FIXTURES for Indexing and Clamping

A complete line of basic Master Fixtures to permit adaptation of a wide range of parts at high production rate with low tooling cost.



FULL AUTOMATIC *Nut Tapping Machines*

Completely automatic hopper feed nut tapping machines up to 5/8"—incorporating simplicity and low tooling cost. Standard taps are used. Precision class 3 and 4 fits and parallelism maintained at high speed and high production.



Announcing . . .

a portable, bench-type comparator for either horizontal or vertical projection . . .

the KODAK CONTOUR PROJECTOR, Model 8

Here's how Kodak brings you new economy in checking small parts by projection gaging:

Two-way staging: Parts can be staged in simple holding fixtures for horizontal projection on the Model 8. Or you can turn the machine on end for vertical projection and simply lay the workpiece on an easily mounted plate-glass stage. Only Kodak provides this choice to simplify your staging.

Choice of magnification: Six precision projection lenses (10×, 20×, 31¼×, 50×, 62½× and 100×) are quickly interchangeable, seat positively for precise rated magnification.

Large work area: Kodak's unique relay lens system gives you uniform, ample working distance at *all* magnifications.

Easily portable: The cast-aluminum Model 8 is easily portable, designed for use on bench or table.

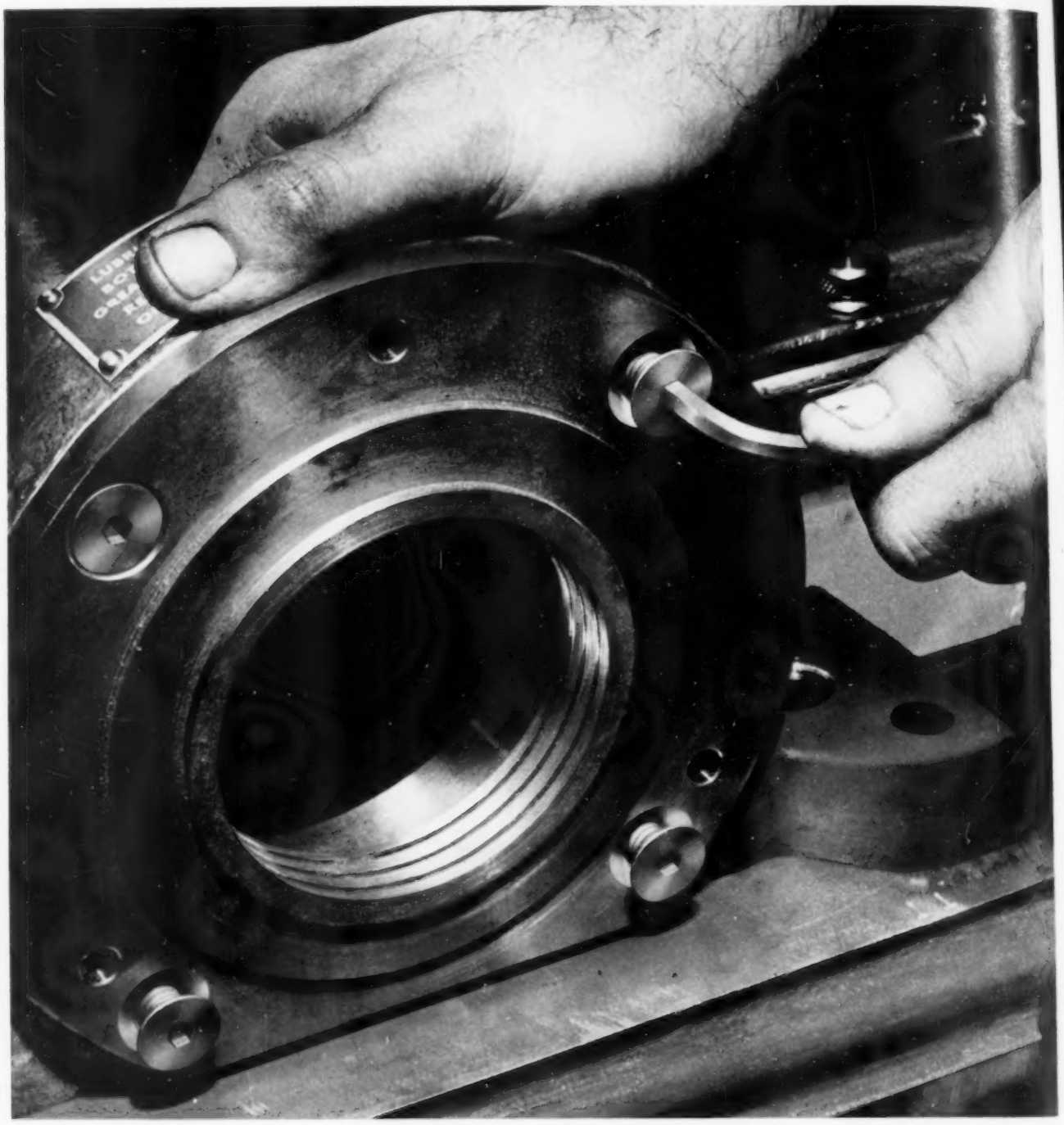
Bright screen image: Coated lenses which increase light transmission—plus a special Fresnel lens back of the screen—yield a bright image, permitting you to use the Model 8 anywhere in the plant.

Optical stability: Kodak's famed Ektar Projection Lenses and rigidly built lens mounts and housings insure accurate performance year after year, provide precision equal to that of large toolroom projectors.

Easy to use: Operators learn inspection procedures quickly, using optical gaging on the Model 8. Erect, right-reading image with both vertical and horizontal projection cuts down training time. Air-cooled lamphouse and handy controls assure operator ease.

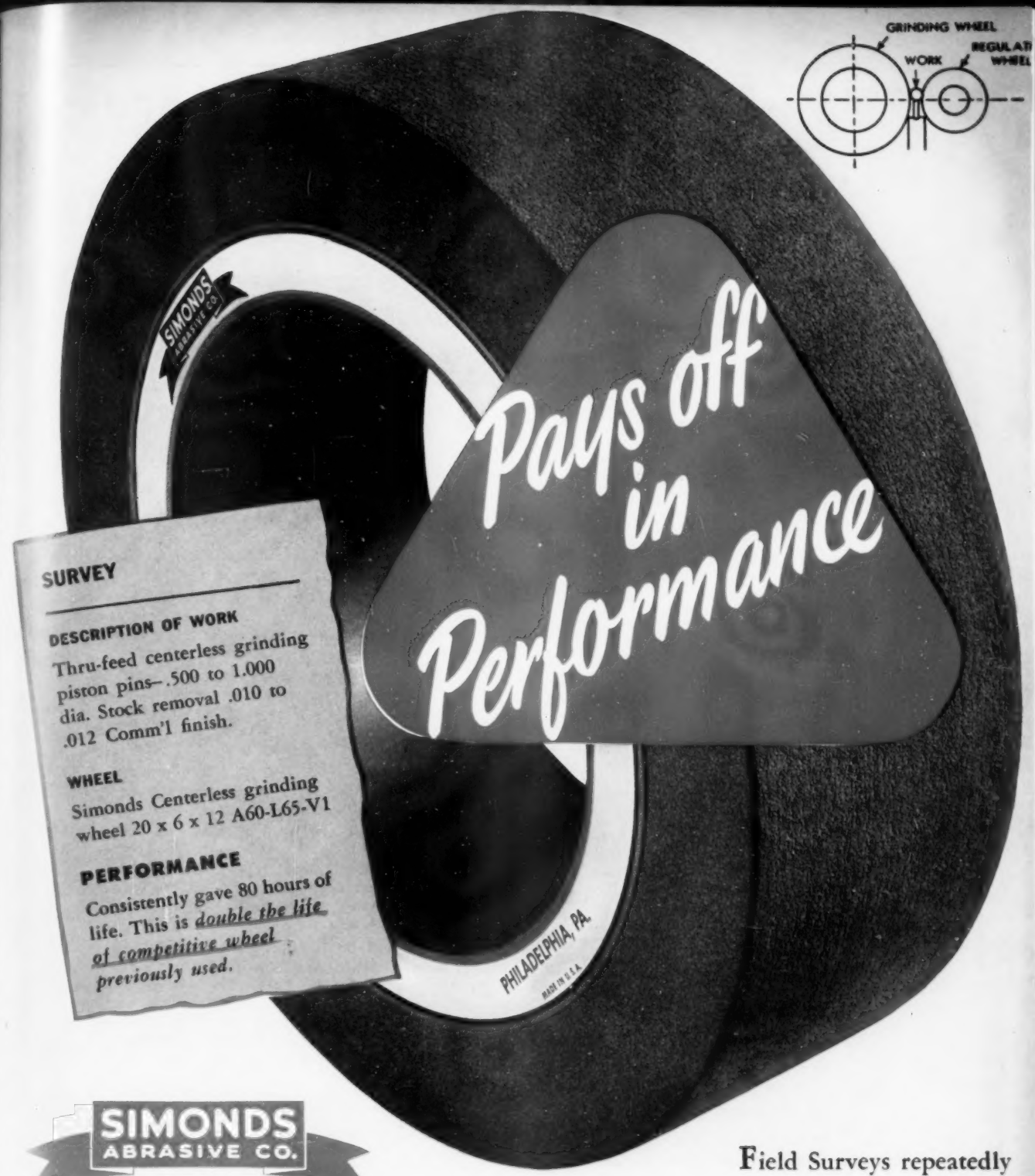
EASTMAN KODAK COMPANY
Special Products Sales Division
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR



FINISHING OFF WITH UNBRAKO FLAT HEADS. Holding a thin-section assembly together, and finishing it off with a smooth, good-looking surface is a job for UNBRAKO Flat Head Socket Cap Screws. These precision socket screws are designed for such applications. Heat treated alloy steel provides the strength. Uniform 82° angle under the head assures maximum contact. Accurate hex sockets prevent marring of the screw head or assembly surface. And these UNBRAKOS are easy to get—they are stocked by authorized industrial distributors everywhere. STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA



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CENTERLESS GRINDING WHEELS

Field Surveys repeatedly prove the high performance of these wheels. They cut free, hold their shapes to give fast, top volume production. Write for bulletin ESA 55.

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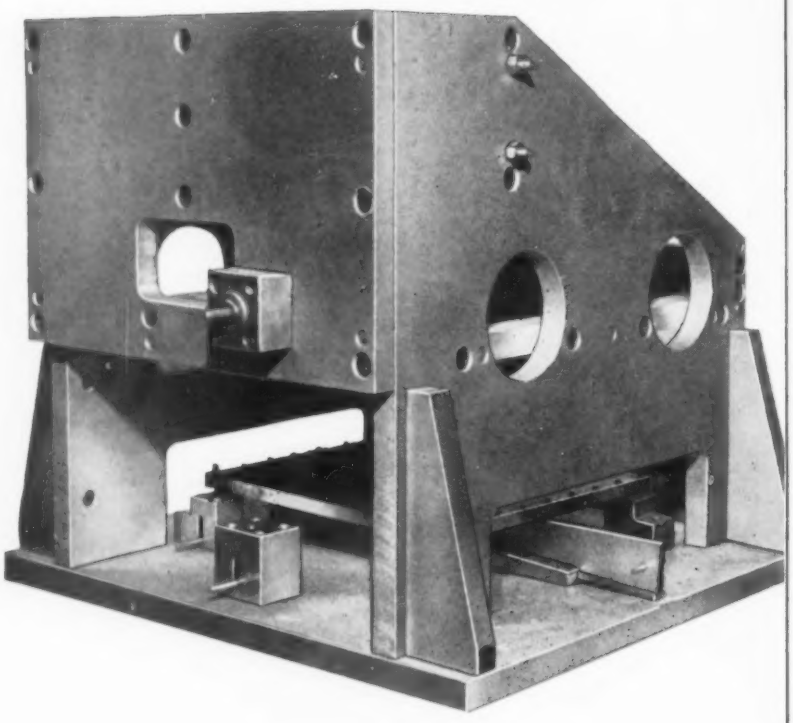
One of a series
MODERN TOOLING TECHNIQUES

STABILITY TO .0005" in Large Check Fixture



by
J. H. Matheny
co-owner
B & M
Engineering Co.
Burbank, Calif.

Specifications called for a check fixture approximately 26" wide, 34" long and 28" high to be light weight and maintain a tolerance of ±.0005".

We specified Pioneer 921-T cast aluminum tooling material. Its positive stability and exceptional mechanical properties made it ideal to meet those requirements.

We specify Pioneer 921-T on other jobs too. One reason is its adaptability to welding without distortion or need of normalizing. This is important because welded structure can cut fabrication costs up to 40%.

Also, Pioneer 921-T is 66% lighter than steel, it has 24,000 lb. compressive strength, and it can be machined at speeds up to 6000 FPM.

The advantages of these and other 921-T features are why we have been specifying 921-T for more than 3 years on assembly jigs, spar cap mill fixtures, drill jigs, check fixtures and various other designs. We think Pioneer 921-T is a remarkable tooling material.

B & M Engineering Company serves industry nationwide in specialized tool and machine design, project design and production engineering. It operates plants in Los Angeles and Burbank, and is a member of both the Southern California and National Tool and Die Manufacturers Associations.

PIONEER
Formula 921-T
cast aluminum tooling plates and bars
for use in jigs, dies, fixtures and special machines.

Write for 921-T Catalog
shows complete range of applications, important mechanical properties, stock sizes and special cast sizes.

WHERE TO BUY 921-T:

PIONEER TOOL ENGINEERING, INC.
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PIONEER SALES ENGINEERING
2233 Inkster Rd.
Inkster, Michigan

MEIER BRASS & ALUMINUM CO.
1471 E. Nine Mile Rd.
Hazel Park, Michigan

TOWNE ALUMINUM SUPPLY CO.
1410 So. Akard Street
Dallas 2, Texas

EDGCOMB STEEL & ALUMINUM
460 Hillside Avenue
Hillside, New Jersey

INDUSTRIAL METALS
General Office
2028 Northern Street
Wichita, Kansas
Warehouses in:
St. Louis, Missouri
Kansas City, Missouri

KASLE STEEL CORPORATION
General Office
4343 Wyoming
Detroit, Michigan
Warehouses in:
Grand Rapids, Michigan
Elkhart, Indiana
Cleveland, Ohio

SOUTHERN STATES IRON ROOFING CO.
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Warehouses in:
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Miami, Florida
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ARMOR-TUF

THE AMAZING NEW STEEL HARDENING COMPOUND

"ARMOR-TUF hardens tools and steel parts as easily as baking pie, and much more quickly."

Now used by leading steel processors and other manufacturers everywhere!

You can use milder, cheaper steels for many applications and machine them before hardening. The saving is two-fold: less expensive steels and lower machining costs. ARMOR-TUF gives low carbon steels the cutting and wearing properties of tool steels. You can harden the softest steels to a degree ordinarily obtainable only in high priced steels.

Service between sharpenings increased 10 times and more. Tools hardened with ARMOR-TUF hold their edges many times longer. The advantages: substantially reduces resharpening costs . . . saves on time lost changing dull tools . . . keeps tools in service . . enables increased production as result of less frequent tool changing and sharpening.

As compared with the usual heat treating processes, the saving in time is great. Instead of hours, only minutes are needed. The entire hardening process takes less than ten minutes .

No CYANIDE, Absolutely — ARMOR-TUF is safe to use, contains no cyanide of any kind or other toxic ingredients.

ARMOR-TUF IS UNCONDITIONALLY GUARANTEED TO INCREASE THE LIFE OF TOOLS AT LEAST 300%, OR YOUR FULL PURCHASE PRICE WILL BE REFUNDED.

Armor-Tuf Sales Corp.

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ARMOR-TUF is available through leading Industrial Supply and Welding Supply firms throughout the United States and Canada

For Quality Socket Cap Screws Look for the Bristol Diamond Knurl

The Bristol Diamond Knurl is the sign of a quality socket cap screw. It high-lights the overall care we take in producing these screws.

Everything about them has to be just right – or they don't pass our quality-control inspectors. As a result, every Bristol cap screw spins easily into place, fits perfectly and wrenches up tightly – so tightly that shock and vibration will never loosen them.

Ask your industrial distributor for the Bristol Diamond Knurled Cap Screws. He's got them in sizes from No. 0 and up in alloy and stainless steel. Most sizes are carried in stock for immediate delivery.

A.5.2

Bristol's Hex Socket Screws

Bristol's Multiple-Spline Socket Screws

Standard in sizes as small as No. 0 in Alloy Steel and Stainless Steel.

BRISTOL'S

BRISTOL'S SOCKET SCREWS

THE BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

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"IN-STOCK" SERVICE ON FAMOUS SPHINX BRAND MICRO-DRILLS

High speed drills for small holes. Sizes from .08 mm (.003") to 1.0 mm (.040") carried in stock, in increments of .01 mm (.0004").

Sphinx brand micro-drills used throughout the world for many years for all fine watch and instrument work.

Send for Bulletin P listing sizes and prices of stock drill sizes and micro-drilling equipment.

These precision drills are available in two styles, flat pivot drills or spiral fluted drills. They are made with concentric oversize shanks. Because of their rigidity they are especially useful in all types of drilling equipment.

LEVIN® Louis Levin & Son, Inc.

3610 South Broadway · Los Angeles 7, California

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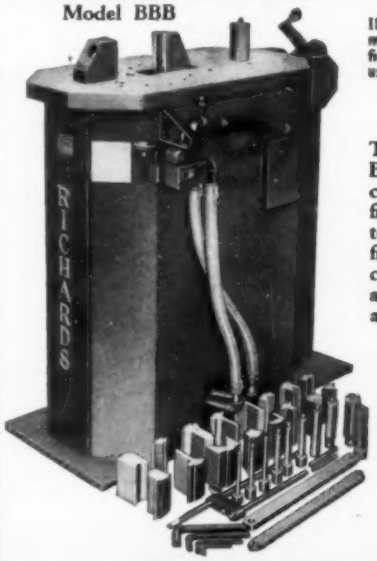
Multiform BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Model BBB

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.



The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller hand or air operated models for forming up to ⅛"x1½" material.

Send for illustrated folder TE-5

903 North Pitcher St.
Kalamazoo, Michigan

J. A. RICHARDS CO.

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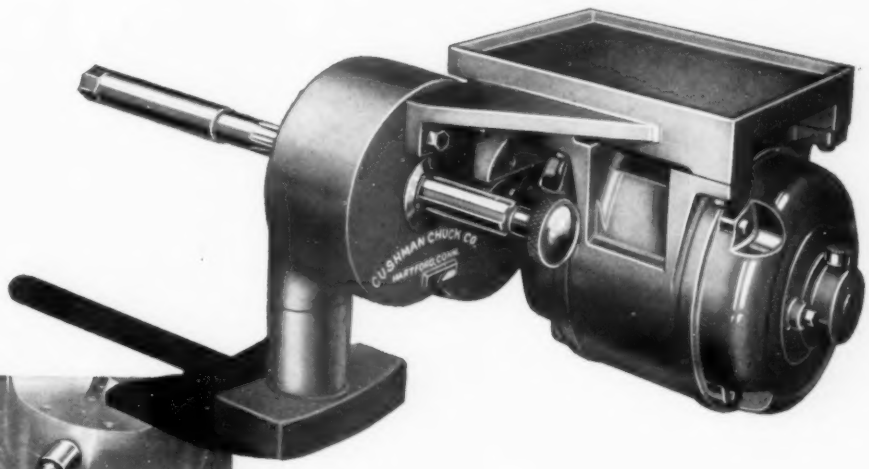
CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

the key to machining efficiency



The Cushman Power Wrench, push-button controlled, eliminates time-consuming, fatiguing, hand wrenching of chucks on single and multi-spindle machines, especially where repetitive machining operations are being performed.

Cushman Power Wrenches are available with either an 8 or 24 ft. lb. motor, delivering a maximum of 180 or 600 ft. lbs. torque respectively. With the addition of the Cushman Variable Torque Control, developed especially for use with the Power Wrench, the operator may, by setting the selector switch, choose any one of 9 approximately equal stages of torque and inertia. Wrenches equipped with 8 ft. lb. or 24 ft. lb. stall-type motors will deliver from 45 to 180 ft. lbs. or 150 to 600 ft. lbs. respectively.

If greater or less driving force is required, the Cushman Engineering Department can design wrenches to suit your needs. Write Cushman for Bulletin No. 211D fully describing and illustrating the Cushman Power Wrench — or, should you have a special work-holding problem, consult Cushman.

THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut

a world standard for precision

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CUSHMAN CHUCKS . . .
A Product of American Quality, Labor and Materials

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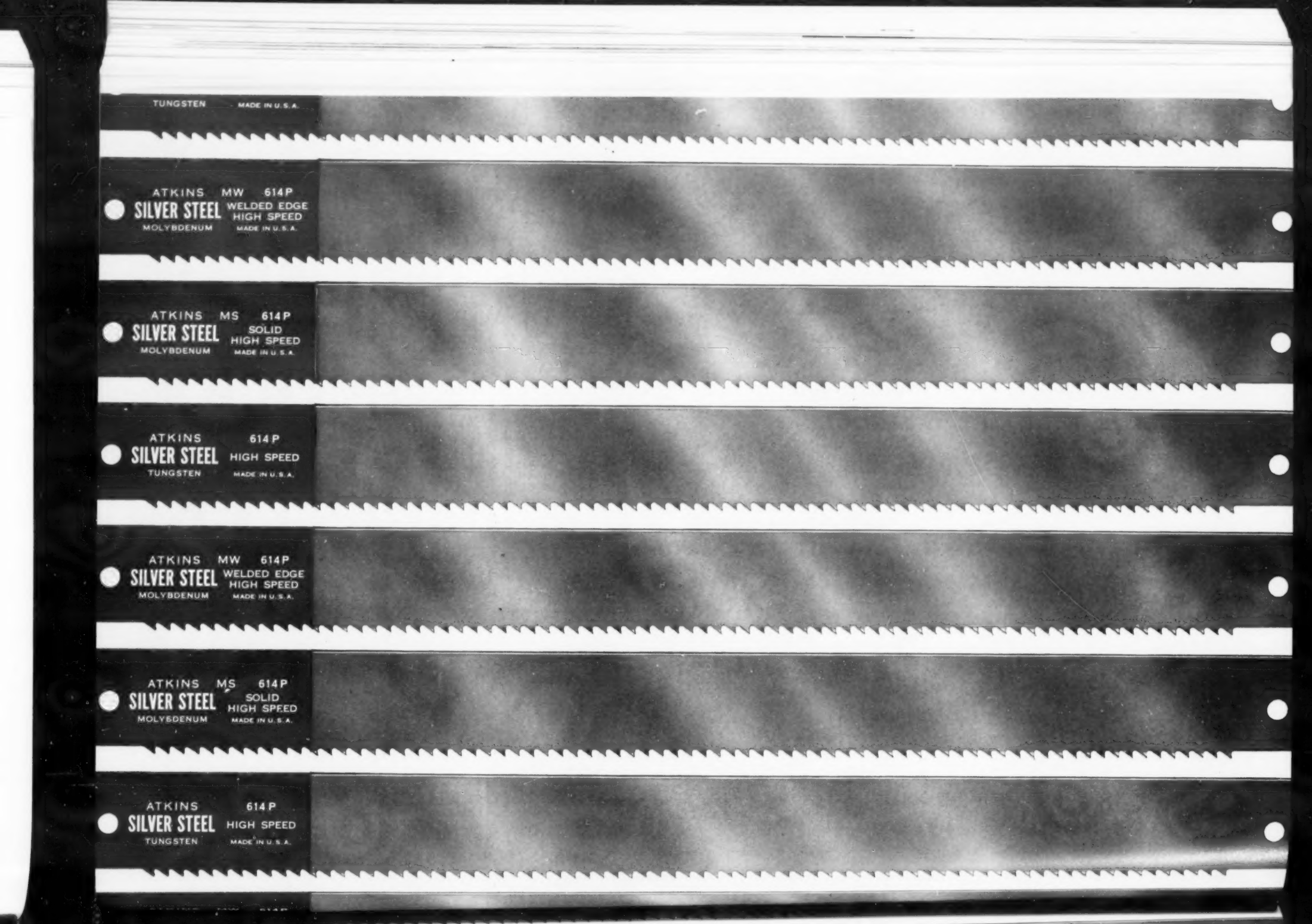
manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.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SILVER STEEL WELDED EDGE HIGH SPEED
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SILVER STEEL HIGH SPEED
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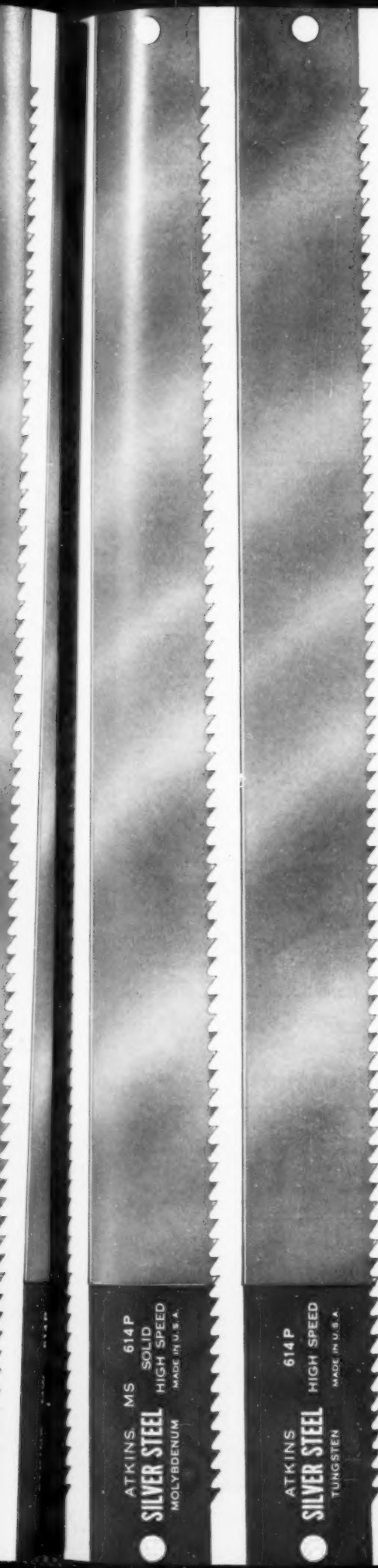

ATKINS
Silver Steel® BLADES
ARE THE FINEST MADE

...and somebody always asks why!

Our metallurgists have found the right alloy . . . our engineers have designed the right cutting edge—the result is the Atkins Silver Steel Blade . . . designed to give you

consistent low-cost operation
maximum production
minimum down time
reduced do-overs
. . . and more cuts per blade

TUNGSTEN—HIGH SPEED— Silver Steel blades for cutting hard, extra tough steels and highly abrasive materials.

MOLYBDENUM—SOLID— Silver Steel blades for general purpose cutting of all metals.

MOLYBDENUM—WELDED EDGE— Silver Steel blades that are shatterproof for top production and extra life in general purpose cutting.

THE ATKINS LINE ALSO INCLUDES:

- metal cutting band saws
- circular metal saws
- segmental metal saws
- carbide tip saws
- precision ground flat stock
- files
- shear blades

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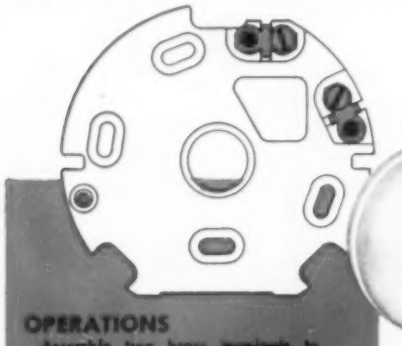
ATKINS Silver Steel SAWS

ENGINEERING B-W PRODUCTION

Bodine CASE HISTORY NO. 40

UNIQUE TOOLING SAVES 90% LABOR



The Honeywell Round

Minneapolis-Honeywell's attractive room thermostat depends upon this unique tooling set-up for economical volume production of the plastic back plate terminal block assembly shown at left. Labor hours have been reduced to about ONE TENTH of previous operations, thanks to this Bodine 42-30 Machine. It's just one example of the versatility of Bodine machines as they lend themselves for special tooling to meet specific job requirements.

OPERATIONS

Assemble two brass terminals to plastic back plate. Tap 3 holes—auto-feed & insert two screws. Inspect for screws & terminals.

PRODUCTION DATA

Previous method, 8.5 hours labor per 1M assemblies. New method, 0.81 hours labor. 7.69 labor hours saved per 1M assemblies. Machine time 1500 cycles per hour. Acceptability at production 94%.

1
FEED TERMINAL STRIP FROM PRESSES
CUT OFF TERMINAL AND TRANSFER
CRIMP TERMINAL

2
TAP TWO HOLES IN EACH TERMINAL

3
TAP ONE HOLE ON WALL PLATE

4
INSERT TWO TERMINAL SCREWS

5
TEST-PROBE FOR COMPLETION

UNUSUAL TOOLING FEATURES: This complete assembly is now made in one cycle of a Bodine 42-30 Machine. The two presses stamping the terminal blanks are coupled to and cycled by the machine, feeding stampings continuously as shown. Terminals are cut-off, inserted and formed over at station one. Back plates are magazine fed. Operator's functions are largely limited to keeping back plate magazine filled and replenishing coils of brass stock on presses.

At end of operation, two inspection probes, advanced from below, test for properly filled screw terminal holes, automatically discard rejects.

With today's demand for cost-saving through grouping of assembly operations, Bodine's extensive experience in the field will prove profitably useful. We invite inquiries. Send your ideas and samples for analysis to Dept. TE-6.

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools."

You're Invited . . .

to visit us at the National Machine Tool Show, International Ampitheater, Chicago, Ill., Sept. 6-17 incl. *Bodine Booth #209.*

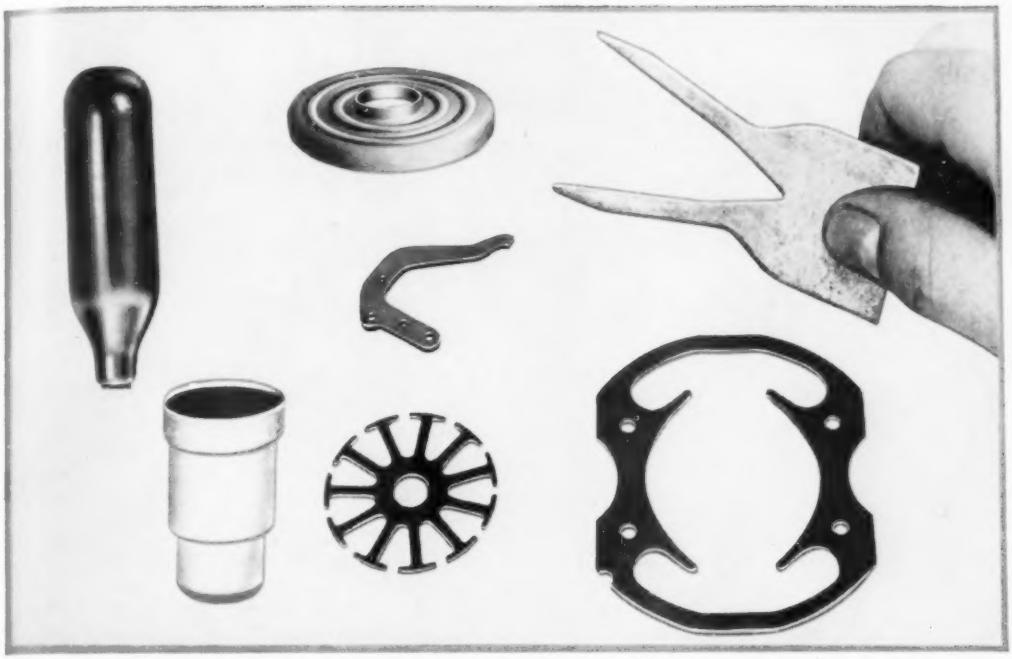
THE
Bodine
CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

BDSS

Large or small,
simple or complex . . .

Carboloy carbide-equipped dies outproduce steel 10 to 50 times



Typical parts produced faster, and at less cost, with Carboloy carbide-equipped dies. These carbides are supplied rough-finished or, where desired, precision-finished, for application by you or your diemaker.

FROM SIMPLE notching dies to complex lamination dies, Carboloy® cemented carbides bring users from 10 to 50 times more production.

Dies equipped with Carboloy carbides cut maintenance and downtime costs . . . produce burr-free, close-tolerance parts.

These carbides have proved their over-all efficiency on hundreds of drawing, forming, blanking, and piercing jobs. And, in every case, brought spectacular production increases . . . at lower cost.

Carboloy engineers are ready to work with you or your diemaker on the design and application of carbide dies. For more information on Carboloy cemented carbides, write, or send coupon, today.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS

Carboloy Created-Metals for Industrial Progress

CARBOLOY
Department of General Electric Company
11101 E. 8 Mile Ave., Detroit 32, Michigan

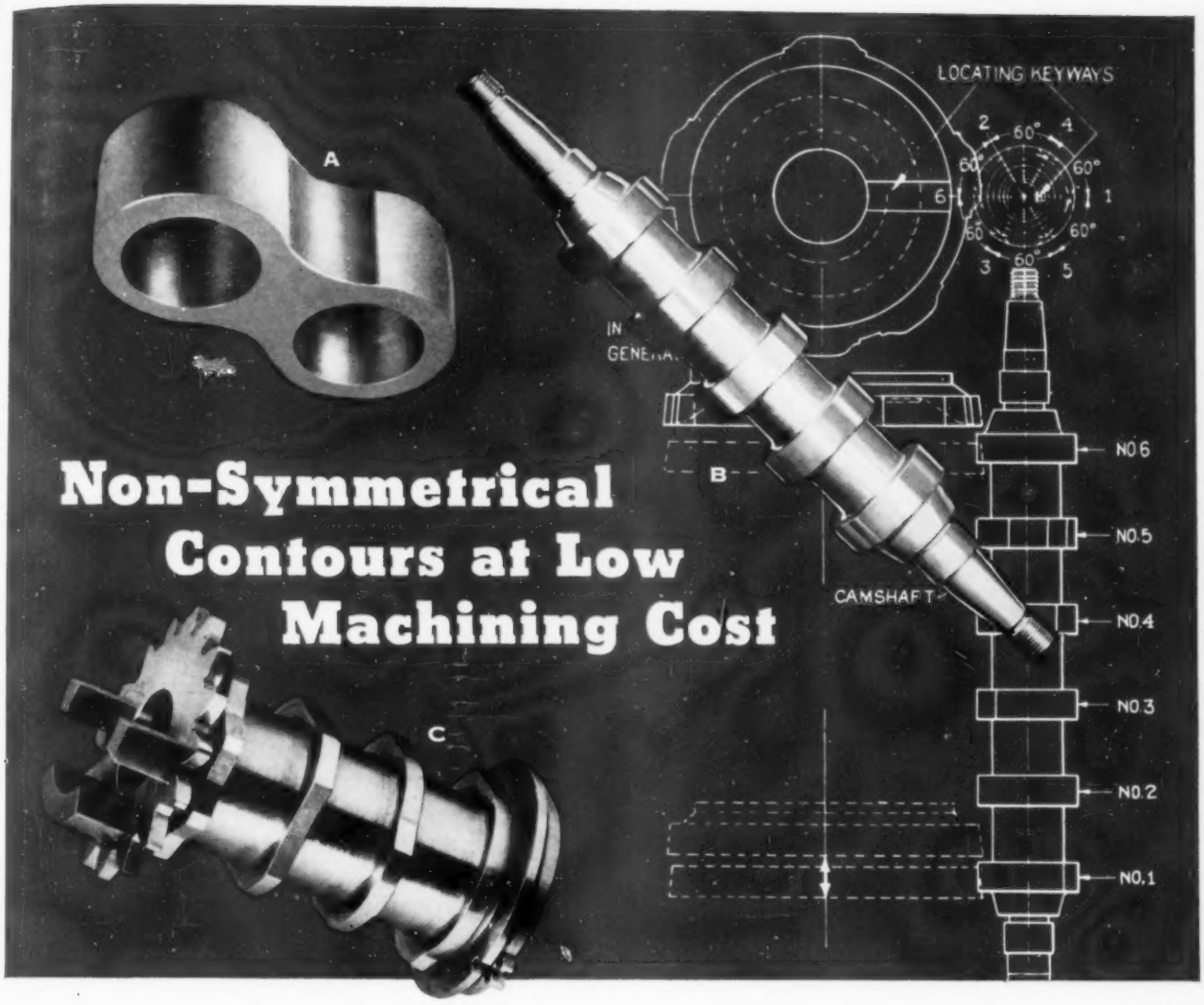
- ☐ Send me Carboloy Die Engineering Manual D-124.
- ☐ Send complete details on Carboloy Die Training School.
- ☐ Have a Carboloy Field Engineer call at my plant.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

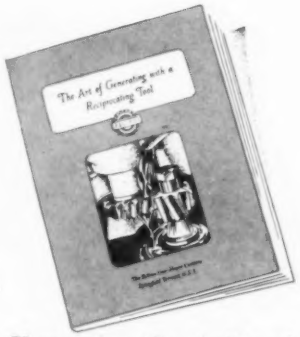


Non-Symmetrical Contours at Low Machining Cost

Molding-Generating commends itself to the shrewd designer. He can plan production on a *standard* Gear Shaper of odd contours for which multiple machining might otherwise be required.

A succession of different profiles can be precision-cut on a single piece (B & C above), often with several contours combined in one cutter. The variety is infinite—symmetrical and non-symmetrical forms, interrupted profiles—and on internal as well as external surfaces.

By simple adjustment and a change of cutters the Gear Shaper can be always busy on standard or special work. Know its versatility!



Yours for the Asking!

"The Art of Generating with a Reciprocating Tool". This booklet gives you detailed information on the design and machining advantages which are inherent in the Fellows Method. *Write for your copy today!*

THE Fellows GEAR SHAPER COMPANY

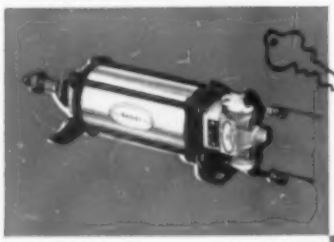
Head Office and Export Dept., 78 River St., Springfield, Vt.

Branch Offices: 319 Fisher Bldg., Detroit 2, Michigan • 5835 West North Avenue, Chicago 39, Illinois • 2206 Empire State Bldg., New York 1, N. Y. • 6214 West Manchester Avenue, Los Angeles 45, California

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-6-247

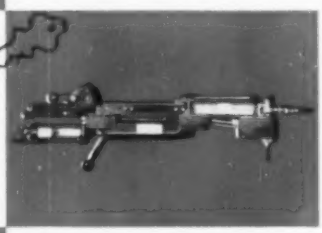
KEYS to COST SAVING

Use one or more of these "CONTROLLED-AIR-POWER" Devices to open the door to BETTER • SAFER • LOWER COST PRODUCTION



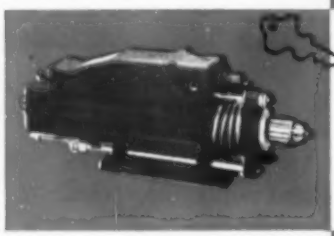
THE BELLOWS AIR MOTOR

The Bellows Air Motor is an integral power unit complete in itself. There are no extra valves to buy. Only one air connection is required. Integral construction means instant piston response to the valve. No lag — no delay. Built-in speed controls assure positive control of piston rod speeds in both directions.



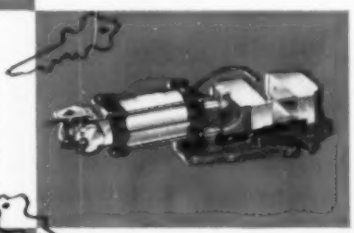
DRILL PRESS FEED

Mounts on any standard drill press in 30 minutes. At a touch on the control lever the cutting tool rapidly advances to the work, moves through the work at correct rate and pressure, and automatically returns to starting position.



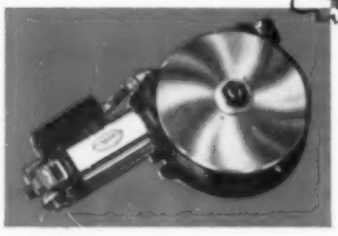
BELLOWS-LOCKE DRILL

A rugged, flexible unit combining electrically driven spindle with rapid, air-powered traverse and hydraulic feed control for peak efficiency drilling. Independent speed controls. Thrust equals 3 times applied air pressure. Stroke length adjusts 0" to 3".



AIR VISES

Flexible semi-automatic holding units to reduce costly "hand time". Light duty unit shown has 4" jaws, opens to 2¼", clamping pressures to 1000 lbs. Heavy duty vises available with clamping force up to 15,000 lbs.



ROTARY WORK FEEDERS

For fast, accurate feeding of work to tools. Work is done at one or more stations as operator loads and unloads at another. Inter-cycle idle machine time reduced 50% or more. All models include built-in speed controls, impulse switch for interlock to other machine elements.

As competition increases in the Metalworking Industry, cost-wise shop men throughout the country are using "Controlled-Air-Power" to help beat the cost problem. Bellows "packaged" controlled-air-power devices are highly flexible work units designed for holding work, feeding work to tools, or tools to work . . . faster . . . safer . . . better . . . and at lower cost. These packaged Work Units are easily interlocked to form low-cost tool-room-built special purpose machines in which several operations can be combined into one.

The heart of these Packaged Work Units is the Bellows Air Motor—the air cylinder with built-in valve and speed controls. A versatile precision work unit complete in itself, the Bellows Air Motor can help cut costs in your shop. Send for additional information.

Write for Bulletin CL-50, address The Bellows Co., Akron 9, Ohio, Dept. TE-655.

HAVE YOU SEEN "OPERATION PUSHBUTTON"?

This new Bellows sound movie shows "Controlled-Air-Power" in actual use in all types of industry including metalworking. See and hear amazing cost saving stories from all over the U. S. A. and Canada. Your Bellows Field Engineer will arrange a showing. You'll find it well worth your time.

The Bellows Co.

Akron 9, Ohio

1136A

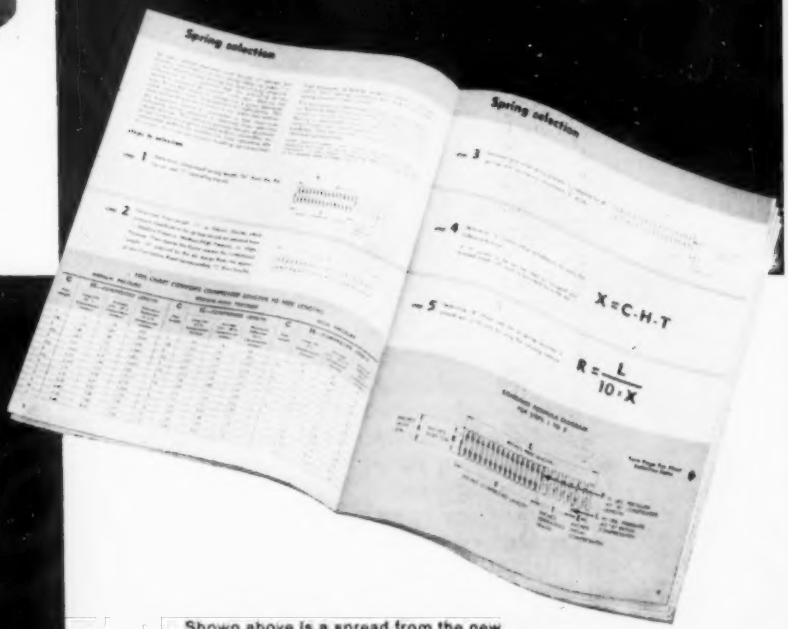
CONTROLLED-AIR-POWER FOR FASTER, SAFER, BETTER PRODUCTION

3 See Danly's New Die Spring Line...

COMPLETE PRESSURE RANGES TO CHOOSE FROM!

Now, you can design longer spring life into your dies. The new Danly Die Spring Line offers you 236 different springs to choose from—with the range of characteristics you've been looking for. Design of all springs in this new line is based on fatigue testing through millions of compressions at recommended loading and deflection.

Select the die springs you need from the new Danly line and get exactly the deflection, spring rate and size you want.



Shown above is a spread from the new Danly Die Spring Catalog—detailing the simplified spring selection procedure worked out for you.

Send For New Catalog...

The new Danly Die Spring Catalog makes selection of the right die spring easier than ever before. Contains complete pressure and deflection data, as well as dimensions. Here are some of the unusual features of this catalog:

- **New Method of Selection** . . . new "step-by-step" selection method simplifies choosing the proper die springs to meet any given problem.
- **Simplified Charts** . . . the regular spring tables are read "straight across" and contain complete details to minimize confusing cross references.

Send for your FREE copy today.

DANLY®

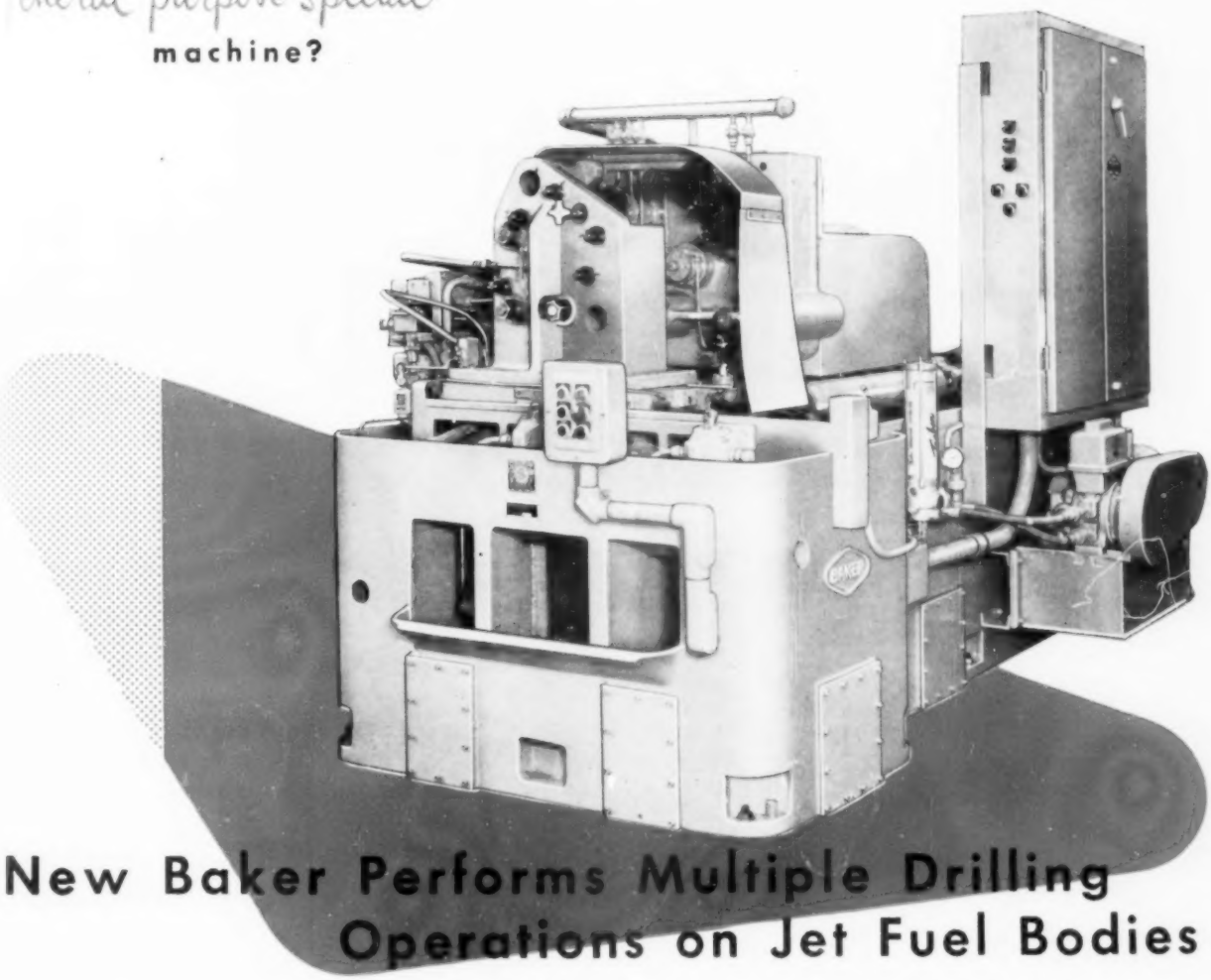
DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

ever hear of a

eneral purpose special

machine?



New Baker Performs Multiple Drilling Operations on Jet Fuel Bodies

- Head and fixture can be changed to meet newly designed product at minimum cost.
- Centralized lubrication.
- Selective operation for hand or automatic operation.
- Mist oiling on stationary bushings.
- Can be supplied with extra shuttle stations if needed.
- Twin pull cylinders (a Baker feature)
- Accurate positioning of shuttle *and* bars registering from head.
- Outside hydraulics, J.I.C. complete.
- Effective cooling of tools (see coolant distributor at top of machine)
- Rigidity throughout.

BAKER

WHATEVER YOUR DRILLING PROBLEM . . . THERE'S A BAKER THAT'S BETTER

BAKER BROTHERS, INC., TOLEDO, OHIO

DRILLING . . . TAPPING . . . KEYSEATING . . . CONTOUR GRINDING MACHINES

NEW CUTTING OIL

permits higher speeds and faster feeds than ever maintained before

Shell Dromus Oil E, a new solution-type fluid, wets all metal surfaces with extreme rapidity and keeps both work and tools exceptionally cool. These qualities permit an increase of machine speeds and/or feeds far beyond anything allowable with conventional soluble oils.

IT'S MUCH EASIER ON TOOLS

There's much more life in any cutter or abrasive wheel when protected by this new oil. *It stays put* between tool and work. (At a 1-80 dilution, average tool life increase in extended field tests was about 50%.)

IT FIGHTS RUST

Shell Dromus Oil E is readily soluble in hot, cold, soft or hard water, and stable in any concentration. Even at low concentrations, it gives excellent rust protection to all ferrous metals, *including*

IT KEEPS WORK COOL

Even at stepped-up production rates, you'll find less heating and better finish wherever this new oil is used.

IT SETTLES OUT FAST

Chips and wheel particles settle out immediately . . . the recirculated fluid is clean and free from contaminating particles. It is *not* sticky or greasy . . . leaves no deposits on machines or work.

IT'S GREAT FOR GRINDING

Grinding wheels remain clean, *even when material retains a film of cutting oil from a previous operation.* Even cast iron can be ground cleanly when Shell Dromus Oil E is used to cool the work.

If all this reads "too good to be true," we suggest that you try Shell Dromus Oil E *on any problem operation you have.* It *is* that good!

SHELL OIL COMPANY

50 West 50th Street, New York 20, New York
100 Bush Street, San Francisco 6, California

Eliminates model change-over problems!

a special production machine—
with standard units . . . quick
change-over features for
each year's design change.
completely automatic—
requires only part
loading and unloading.

Morris Unit-Type Machine Tools provide truly specialized machining of your product . . . using standard production components . . . add flexibility to your high-speed mass production operations. They may also be re-aligned and additional drill units added for model alterations, or for complete new models, without scrapping the machine.

For example, the Morris MOR-SPEED production machine illustrated, drills, burrs, reams, taps and spotfaces carburetor air horns at the rate of 375 pieces per hour at 80% efficiency!

Its standard basic construction provides a stationary circular center column with Morris AIR-OIL-MATIC Drill Units mounted on the column and on the removable platen for station operations. Parts are placed in air-power clamped fixture by the operator. The table indexes automatically through 12 stations, controlled by hydraulic indexing mechanism. 24 operations on 21 holes on 4 perpendicular faces and one angular face are performed on each piece. Operator merely loads unfinished pieces, unloads completed parts. Cams on center column automatically index and position fixtures at each station.

Morris AIR-OIL-MATIC Drill Units, mounted in vertical, horizontal or angular planes at the stations, provide accurate high-speed machining.

Easy Maintenance

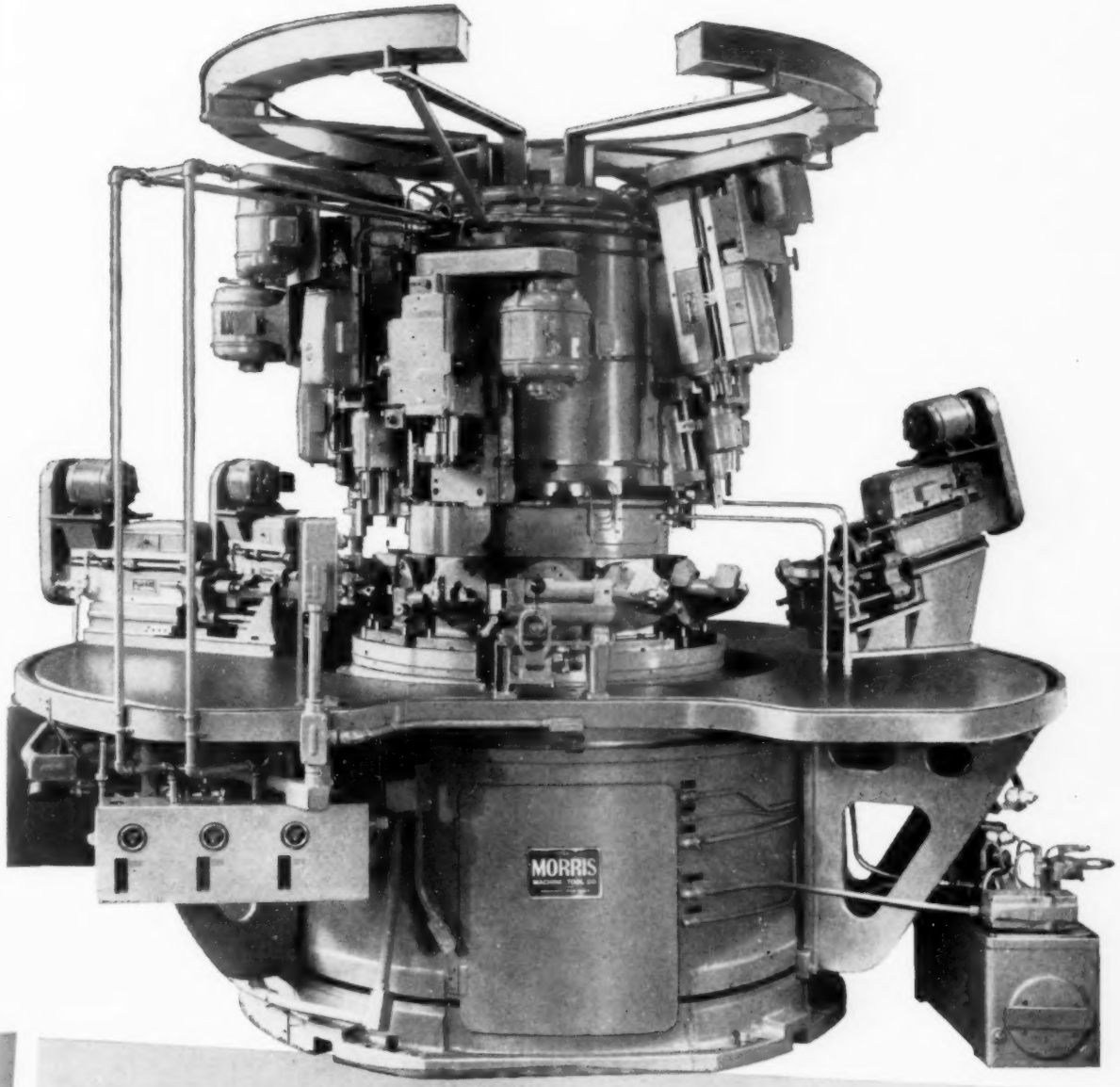
Each drill unit is provided with independent feed and speed, permits adjustment of individual units without affecting entire machine. Standard units, stock parts, speed machine maintenance. Operational difficulties may be pin-pointed, given prompt attention.

MORRIS AIR - OIL - MATIC DRILL UNITS

• Adjustable Feed, Stroke and Rapid Approach • Trouble-free Hydraulic System
• Wide Range of Spindle Speeds • Convenient Controls
• Air or Oil Powered • Hydraulically Controlled

A powerful package of precise versatility, developed by Morris, one of the nation's leading manufacturers of high production drilling machinery. Available for use in special purpose machines like the production machine illustrated.

AIR OR OIL POWERED — HYDRAULICALLY CONTROLLED!
Designed for a wide range of drilling, reaming, chamfering, spot-facing, hollow milling, centering and related operations, the unit can be mounted in vertical, angular or horizontal positions. The Morris AIR-OIL-MATIC Drill Unit has adjustable feed rate, feed stroke and total stroke. Controls and actuating devices can be set to provide almost any sequence of operations.



You'll want to know how MORRIS Unit Type Machine Tools, MORRIS AIR-OIL-MATIC Drill Units can be applied to solve your mass production involving multiple drilling, reaming, tapping and boring.

Write for detailed descriptive literature . . . or outline your production problem for prompt attention by Morris engineers.

THE MACHINE TOOL SHOW

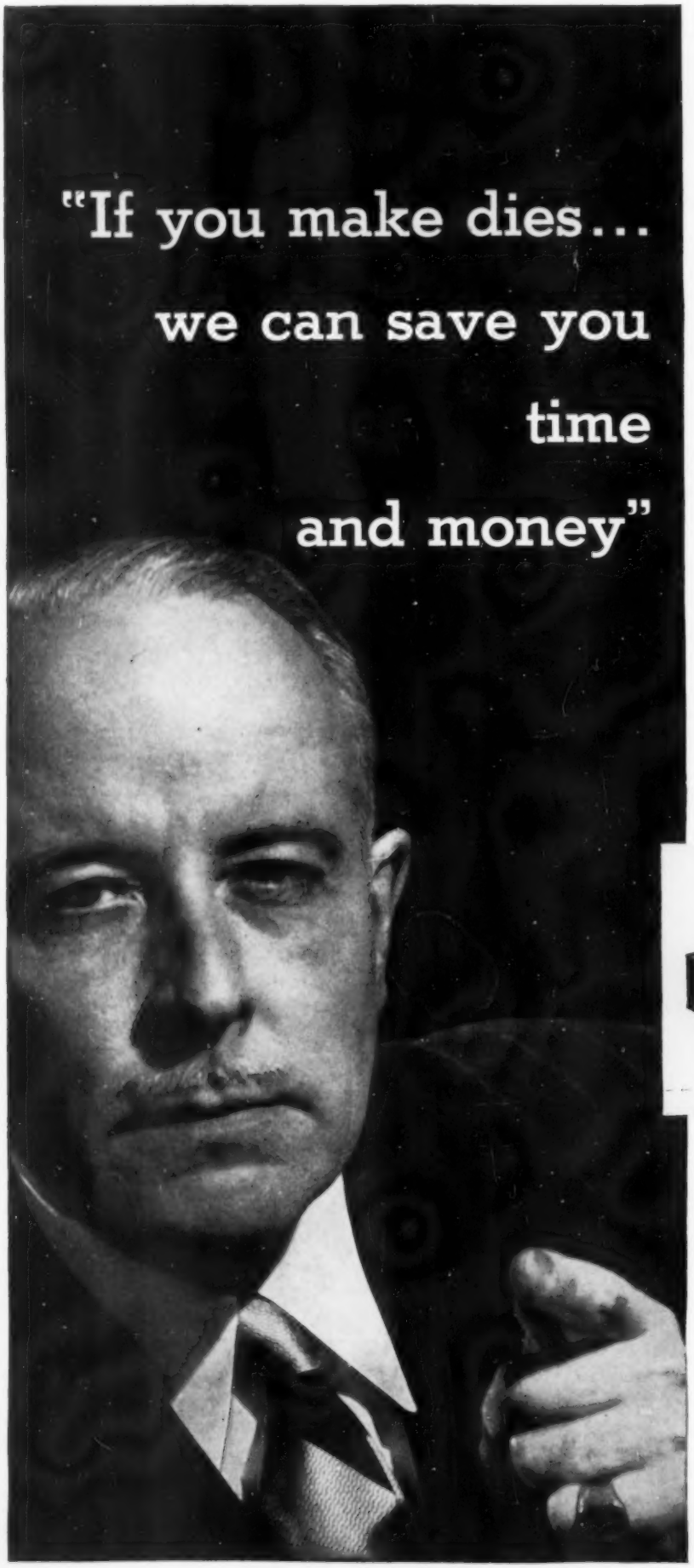
VISIT US AT BOOTH #912
THE MACHINE TOOL SHOW
Chicago, Illinois, Sept. 6-17, 1955
International Amphitheater

Collins & MOR-SPEED Line

Morris

THE MORRIS MACHINE TOOL CO.

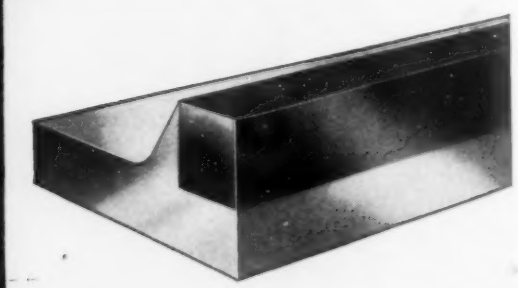
950 HARRIET STREET . CINCINNATI 3, OHIO



You save time because OK Composite Die Sections are carried in stock ready for immediate shipment to you. They are available for Cutting, Trimming and Forming Dies. You can order them cut to length or in bars 125" long. There are 11 standard cross sections with both wide and narrow lands.

You save money because you can buy them at a price far below what it would cost you to make them yourself. And the soft steel backing, to which uniformly hardened steel is clad, is drilled quickly and economically for dowel and screw holes. Adjustments for wear are equally simple.

Companies now using OK Composite Die Sections report great time and money savings over competitive products formerly used.



You'll be interested in receiving FREE a new Bulletin on OK Composite Die Sections and Clad Aluminum Bronze Wear Plates. Write Dept. 42-U.

THE OHIO KNIFE CO.

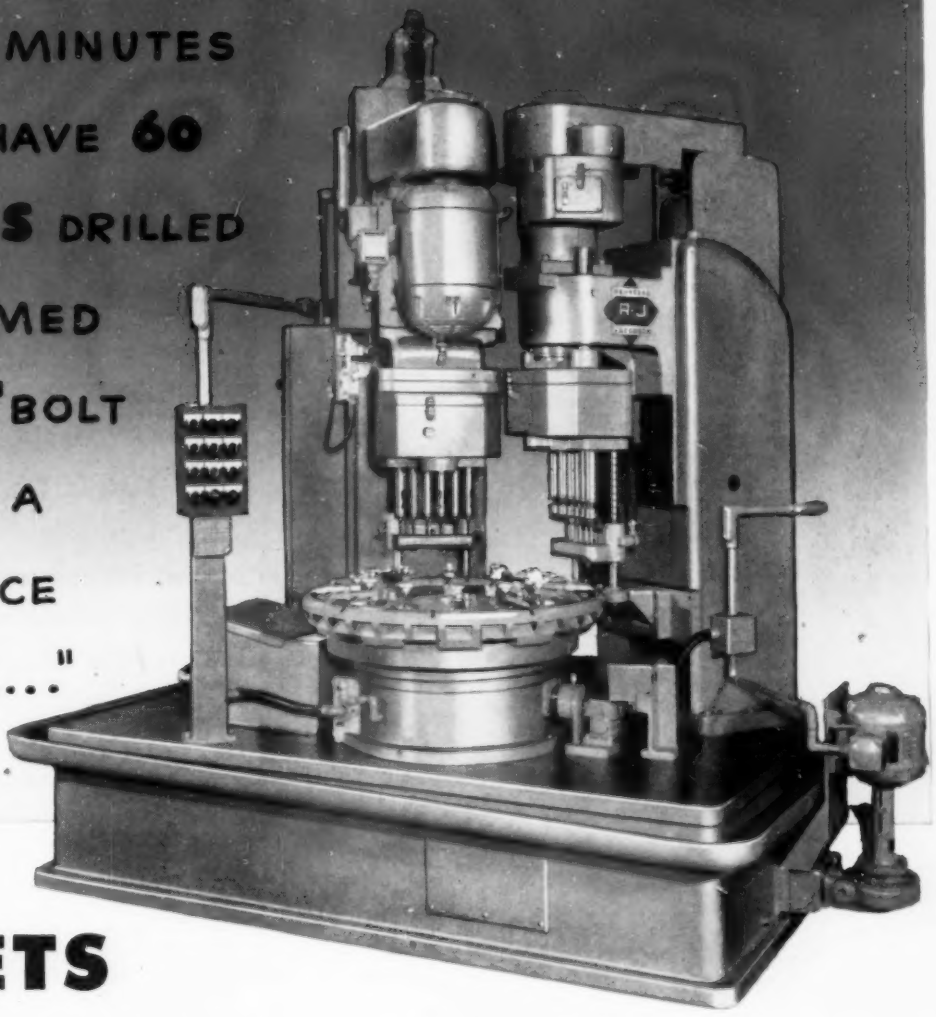
CINCINNATI 23, OHIO

Manufacturers for the Metal Working Industry of:

Slitter Knives • Shear Blades
Work Rest Blades • Cut-Off Blades • Hardened Spacers
Hardened Ways • Gibs • Ball Races • Bronze Ways
Wear Strips

Rehnberg-Jacobson

"LOAD IT, START IT, AND WALK AWAY... COME BACK IN 6 MINUTES AND YOU HAVE 60 5/16" HOLES DRILLED AND REAMED ON A 34 1/2" BOLT CIRCLE IN A STEEL PIECE 3/4" THICK..."



FOR JETS

This little trick is used for putting the 60 bolt holes in a stator blade adjusting spacer for a well-known make of jet engine. An important requirement is that the holes must be equally spaced within .005" of each other. The table has ten positions, as you might guess from the 6-spindle heads. Actually, it makes 14 indexes; on the first two the reamers don't work, and on the last two the drills hold back — all automatically. The machine is simply constructed of mostly standard elements, openly designed for easy work handling, is easy to operate, and easy on the maintenance crew. Those features are characteristic of Rehnberg-Jacobson machines.

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

R-J

2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS

...AMPCO* Metal improves its high physicals, retains ductility (does not become brittle) — even at extreme low temperatures

Its ability to perform dependably under conditions of extreme cold without becoming brittle is one of Ampco Metal's more unique properties—but one, nonetheless, that really pays off for designers of Arctic equipment, above-the-atmosphere missiles, gas liquefying machinery, and similar applications. Tests made with Ampco Metal to temperatures as low as –400° F. show that it remains ductile, retains its high mechanical values, even at this brutal, machine-punishing cold.

But the Ampco story doesn't stop there. This series of remarkable alloys gives you high strength-to-weight ratios — tensiles to 110,000 psi with 10 to 15 percent less weight than ordinary bronzes. It combats all forms of wear — sliding wear, erosion, corrosion, fatigue.

All the advantages of one of the world's most versatile metals are yours when you specify Ampco Metal. Get full information from your nearby Ampco field engineer or write us.

AMPCO®

Sole Producer of Genuine Ampco Metal

AMPCO METAL, INC.

Dept. TE-6, MILWAUKEE 46, WISCONSIN • *West Coast Plant:* BURBANK, CALIFORNIA

*Reg. U. S. Pat. Off.

W-136

No. 2 in a series

Will your next "Automatics" meet the requirements?

You get demonstration of your work and complete job development record

Cone submits samples of your work

Cone makes recommendations

You send print to Cone

The use of carbide setups on Conomatics is moving along so rapidly that it is just good business to make very certain that your next multiple spindle automatics will meet 100% carbide tool requirements.

You can be certain by seeing a demonstration of the machine of your choice equipped with carbide tools on your own work. That is, you can if it is a Conomatic.

Without charge, except for bar stock and tools, you can be an on-the-job witness to a carbide test run of your own work on a Conomatic.

And whether you are ready for carbide now, or will be later, you will want to consider a machine that is superior for either carbide or hss.

DATA FOR COMPARISON

Part ..... Roll	Depth Hole ..... 1 1/32"
Machine ..... 1 5/8" Six Spindle Conomatic	Work Dia. ..... 1 9/16"
Material ..... 8620 HR	Drill Dia. ..... 1 1/16"
Tools ..... 100% Carbide Tipped	RPM ..... 1216 Work Spindle 1040 Op. Drill 2256 Total Eff'd.
Stock Size ..... 1 5/8"	
Length ..... 1 1/32"	Time ..... 10.7 Seconds

Conomatic

For particulars send for "Four Steps With Cone"

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

Fast, low-cost tooling with compounds based on BAKELITE TRADE-MARK Epoxy Resins

Frequent model changes and tough competition demand quick tooling at less cost. Look into these advantages of BAKELITE Brand Epoxy Resins for metalworking tools:

- **Liquid compounds—can be cast to shape without pressure**
- **Cured at room temperature—no applied heat**
- **Minimum shrinkage—minimum finishing**
- **Excellent flexural, compression, and impact strengths**
- **Outstanding dimensional stability**
- **Light weight means easy handling**
- **Laminated with glass cloth to form jigs, spotting racks, fixtures, and Keller models.**

Ren-ite® Plastic tooling compounds cut costs on this job by four fifths! Delivery time was cut 70 per cent! Drop hammer dies for this press are made of compounds based on BAKELITE Epoxy Resins and produced by **Ren-ite Plastics,** Lansing 4, Mich. The dies stamp these trays out of 75 SO aluminum sheet.

BAKELITE BRAND EPOXY RESINS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

DISSTON STAINLESS STEEL

...hot rolled to SHAPE

saves steel · tooling · machining

Stainless steel users receive many advantages by ordering Disston steel shapes accurately rolled to their specifications.

LESS MACHINING. Tool operations are simplified, for Disston shapes are rolled to precision tolerances, have exceptionally fine finishes.

REDUCTION IN WASTE MATERIAL. Preshaped Disston steel reduces scrap losses. One well-known manufacturer saved 47% of stainless steel tonnage by starting with a rolled Disston shape—instead of a rectangular section.

LOW-COST HANDLING OF SMALL ORDERS. Jobs as little as five or ten tons on a particular shape are rolled easily, economically in the Disston mills. Over 100 years of leadership in the rolling of special shapes gives Disston the edge in metal-shaping skill and technique.

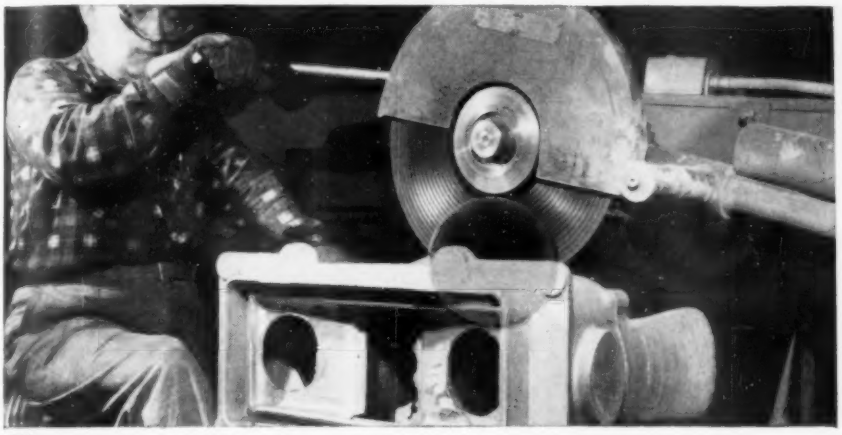
Why not talk over your requirements with a Disston representative? Learn how much you can save by using Disston stainless steel shapes. Or write to:

Henry Disston & Sons, Inc., Steel Sales Division
692 Tacony, Philadelphia 35, Pa., U. S. A.

DISSTON HAS THE EDGE®
in special purpose steels
and special steel shapes.

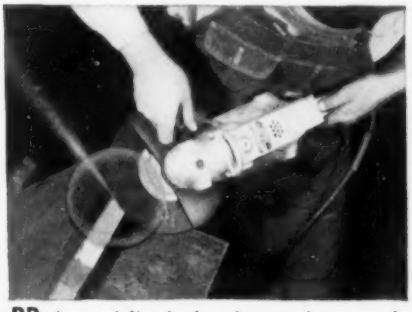
100 YEARS OF FINE STEEL MAKING

BF A Universal favorite for removing light welds, breaking edges on machined work, deburring, taking off flash from plastic parts and many other light portable and bench grinding operations. To be used on periphery only.



BN The preferred cut-off wheel for non-ferrous and non-metallic jobs. Also excellent for cutting wire rope, slotting rails, tuck pointing, etc. Used on swing-frame and stationary type cutting-off machines, large and small portables.

BF MOUNTED WHEELS AND POINTS have the same strong laminated construction as the larger BF wheels. For polishing die cavities, chamfering, Brinell spotting, etc. For hand finishing, use BF sticks.



BD A specialist in heavier stock removal, such as welds on fabricated work, smoothing flame-cut edges, cleaning between teeth of gear castings, etc. — also for slotting, notching and cutting-off.

BFR Excels at the lighter portable jobs, such as rust and scale removal, light weld grinding, scarfing and beveling, blending contours, notching gates and risers.

The jobs they do!...The money they save!

Norton Reinforced Wheels add the "TOUCH of GOLD" to countless everyday grinding jobs

With Norton Reinforced Wheels you get extra-long service life, exceptional strength and fast, cool, trouble-free grinding — the Norton-engineered "Touch of Gold" that saves you money in the widest range of routine grinding jobs, from light deburring to heavy cutting-off.

To this top grinding performance Norton Reinforced Wheels add a wide margin of safety. All four are resinoid bonded and reinforced by layers of tough fabric molded into them. As follows:

BF — *Semi-flexible straight wheel, cotton fabric reinforcement. Also available in mounted wheels, points and hand sticks.*

BN — *Straight wheel with glass cloth reinforcement. Primarily a cut-off wheel, its rough, knurled sides provide additional cutting action.*

BD — *Rigid hub-type. Glass cloth and Nylon reinforcement. Designed especially for right angle portables and disc sanders.*

BFR — *Semi-flexible hub-type. Cotton fabric and Nylon reinforcement.*

SEE YOUR NORTON DISTRIBUTOR

for a demonstration of Norton Reinforced Wheels in your shop. Ask him for the big new catalog on Reinforced Wheels. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

Making better products . . . to make your products better

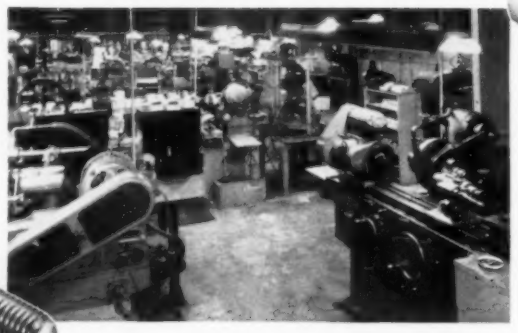
W-1638

NORTON

and its BEHR-MANNING division

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Produced in a modern plant under ideal controlled conditions, with quick deliveries from stock as a special service to HEMCO customers.



HEMCO-PROCESS GAGES

MUCH LONGER WEAR LIFE — so much more life that you'll wonder how it can be possible. But if you will put HEMCO-PROCESS GAGES to the test in your own applications, this extra wear life will reveal itself with a most convincing demonstration.

MUCH LOWER GAGE COST — so much less money to invest in your working gage needs that you'll count your savings in terms of thousands of dollars, — thanks to HEMCO-PROCESS GAGES low initial cost and their wear life.

MUCH HIGHER GAGE QUALITY — a precision quality that you can see and feel, — quality that stamps HEMCO-PROCESS GAGES as the ultimate in their field.

THE ANSWER TO ALL THIS is found in the exclusive HEMCO PROCESS, — the only process that imparts a super hard Chrome surface which is unqualifiedly guaranteed not to chip or peel, no matter what type of gage. Case histories, covering all kinds of industrial and U. S. Procurement customer situations, prove the superior merit of HEMCO-PROCESS GAGES. Try them, — and let them write their own performance ticket for you.

All types and sizes of standard working gages, as well as special types for even the most unusual applications, engineered to customer specification.

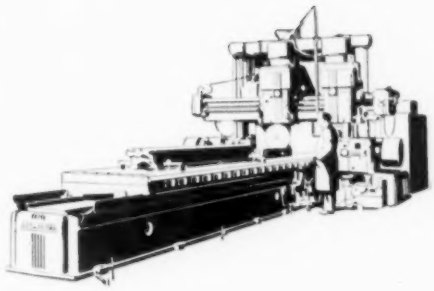
Inquire about the COMPAROSCOPE — the versatile optical instrument for evaluating surface finishes.

DISTRIBUTORS are invited to request information on available opportunities.

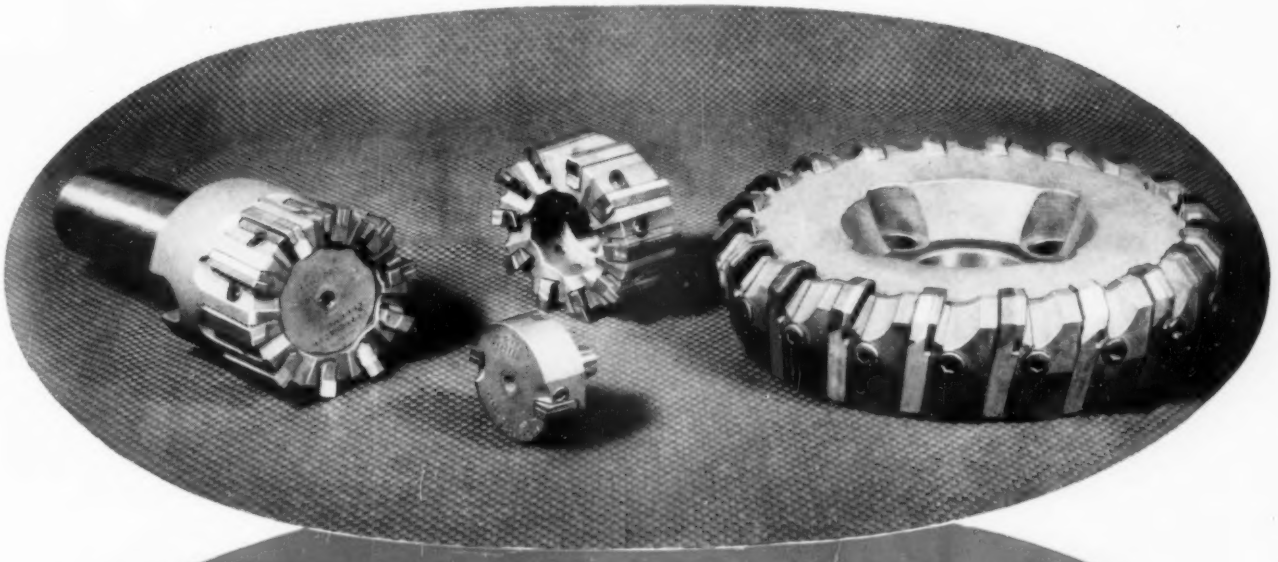
H. E. MORSE COMPANY • HOLLAND, MICHIGAN

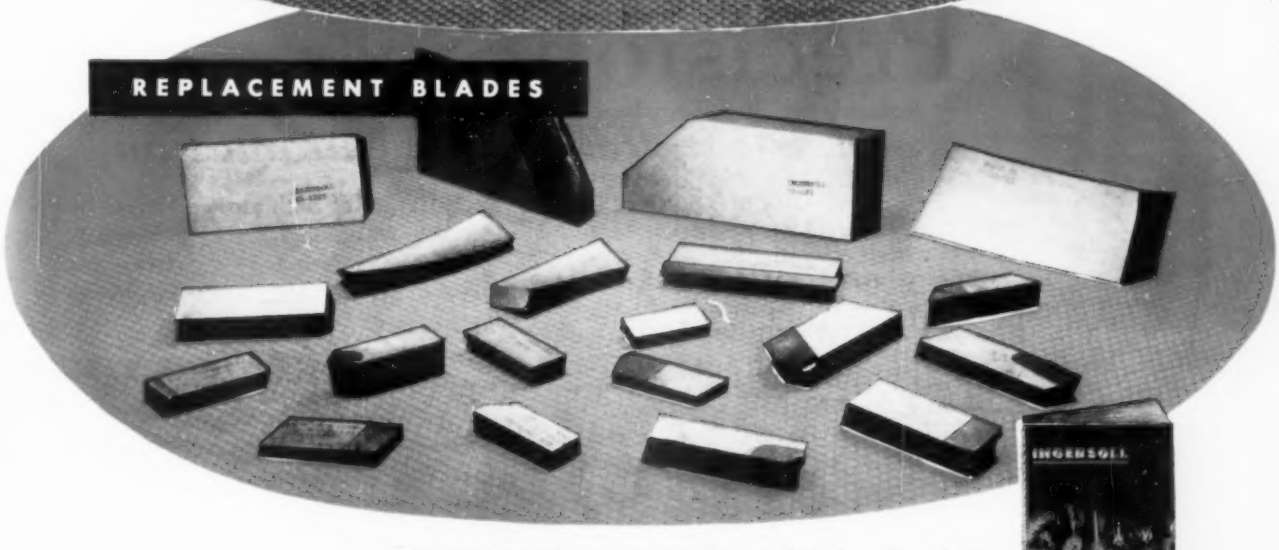
DO YOU CONSIDER THE COST OF REPLACEMENT BLADES WHEN BUYING CUTTING TOOLS?

In one year, a milling cutter in active service uses blades costing more than the original price of the cutter. *We furnish seven sets of replacements for each set of blades sold as original equipment.*



Ingersoll cutters offer the combined advantages of superior performance and substantial long-term economies in blade costs. The cost of Ingersoll blades is low because their design is simple and they are manufactured with good production equipment.





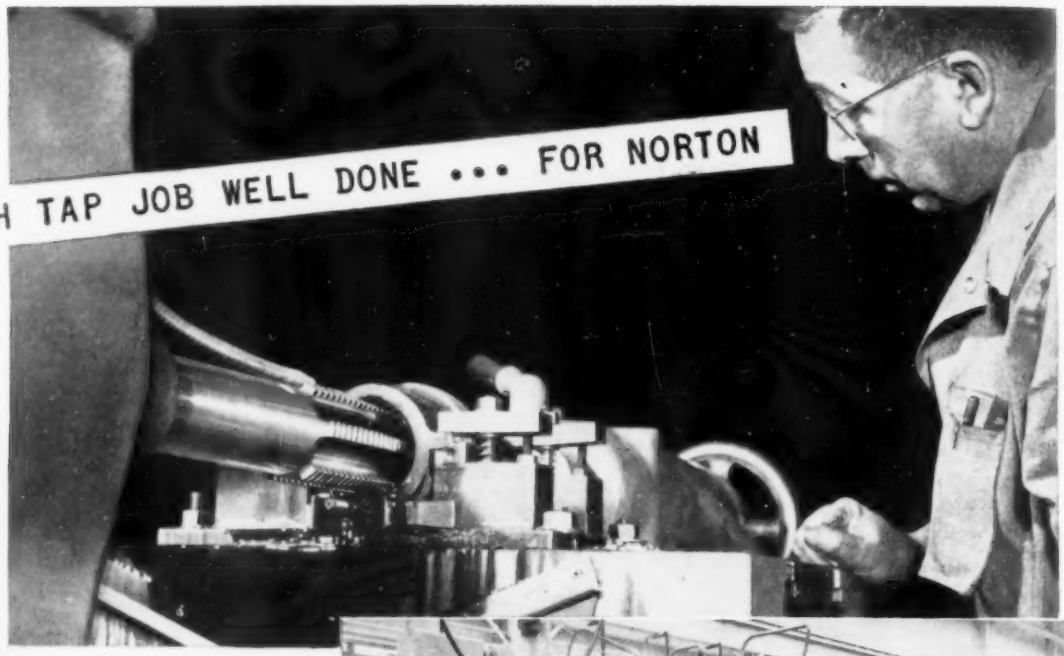
WRITE FOR Catalog 60F, describing Ingersoll Inserted Blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads.

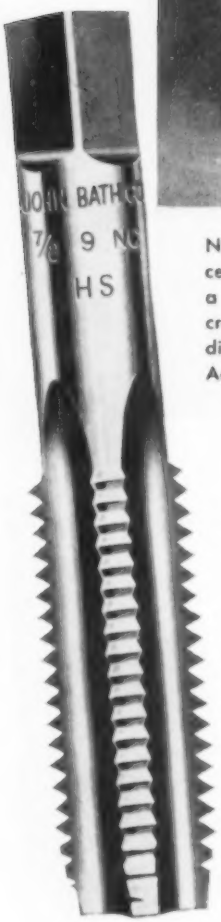
THE INGERSOLL MILLING MACHINE COMPANY

ROCKFORD, ILLINOIS, U.S.A.

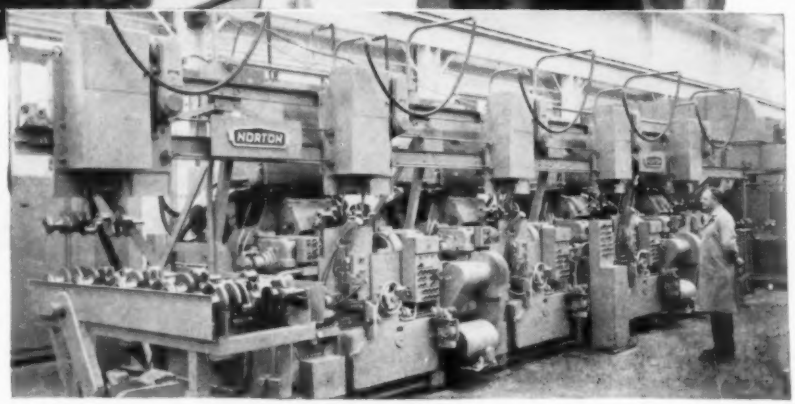
BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES

ORIGINATORS OF SHEAR CLEAR CUTTERS





Norton operator at Worcester, Mass. plant, threads a full nut for automatic crankpin grinder with 3½" diameter, 2½ pitch Bath Acme tap.



Precision

. . . a basic ingredient of Automation

This new Norton Transfer Type Crankpin Grinder is the first fully automatic machine for this difficult operation and was recently installed in the new V8 engine plant of Studebaker Packard Corp. at Utica, Mich.

These automatic operations . . . locating, grinding, gaging and transferring, require one basic work ingredient . . . PRECISION.

Extreme accuracy of components includes threading and gaging the parts that move heavy wheel heads to produce crankpin diameters to close tolerance.

Selection of Bath taps and gages by Norton to do this work, is tangible proof of the Bath Line reputation for dependable accuracy and economical performance.

When you build any type of machinery . . . be sure to remember that accuracy starts with the production of component parts. When it comes to threading and gaging . . . industrial leaders rely on Bath taps and gages for the all-important work ingredient . . . PRECISION.

Insist on BATH TAPS for BETTER THREADS

JOHN BATH & CO., Inc.

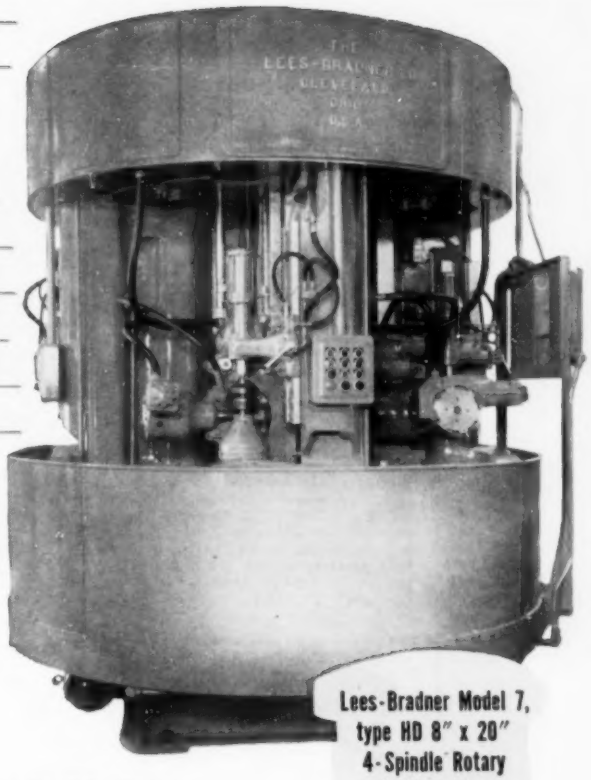
28 Grafton St., Worcester, Mass.

PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

LEES-BRADNER

Sets the HOBBING pace for tomorrow

with 4 machines in 1



Lees-Bradner Model 7, type HD 8" x 20" 4-Spindle Rotary Hobber. Also available in single and 6-spindle models.

Here's a complete hobbing production line in one space-saving unit.

Actually the Lees-Bradner Model 7, Type HD 4-Spindle Hobber is four separate and independently operative machines in one. Each hobbing unit incorporates basically the same automatic, high-production features as the remarkable 7 type HD Single Spindle Hobber. This includes a heavier, more rugged headstock, heavy-duty column and a 10 H.P. motor.

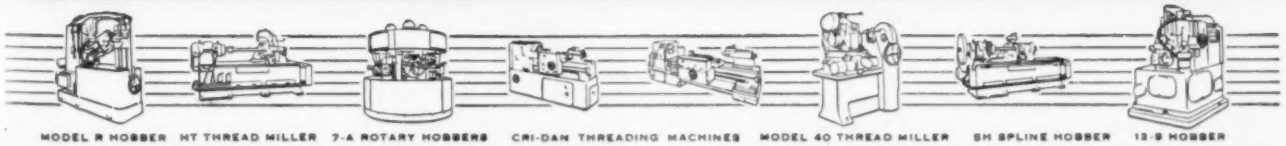
This amazingly efficient machine not only saves valuable floor space but, with its pushbutton controls and automatic features, actually controls the operator thus reducing the chance for human error or slowdown. Chips and coolant are easily carried away from the headstock by the elimination of flat surfaces.

So, if your manufacturing space is valuable and high unit production important, ask your Lees-Bradner representative to give you the story on the ultra-efficient 4-spindle rotary hobber. Write or wire us direct for his name and address in your area.

View of new Type HD headstock with increased bearing surface between column and headstock, heavier casting, coolant and chip carry-away.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

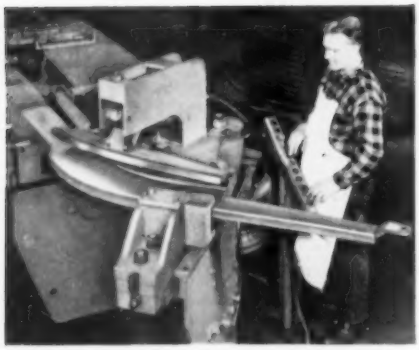


MODEL R HOBBER · HT THREAD MILLER · 7-A ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

HOW MAJOR INDUSTRIES NOW CUT *Product Costs*

1 AIRCRAFT TUBING—Smooth, extra sharp bends now produced in ultra-thin stainless steel tubing, saves space and $14,000 per plane for aircraft manufacturer. Shown above, Pines Size 4 Unit forming wrinkle-free 8" c/l radius bend in 4" x .020" S. S. tubing.



2 HOLLOW TRACTOR BOOMS—Cold bending 12 ga. welded steel tapered tubes without distortion on Size 4 Pines unit eliminates expensive blanking and forming dies, saves tons of material for farm equipment manufacturer.

3 EXTRUDED WINDOW FRAMES — Part of production line setup in large aluminum fabricating plant, this small Pines Semi-Automatic saves space, accurately bends automobile window frame moldings.

with PINES PRODUCTION BENDERS

The examples shown here are a few of the countless number of production jobs that are now handled efficiently and more profitably on Pines Automatic Benders. They illustrate the versatility and the many cost-cutting advantages of cold forming round, square, rectangular, extruded, or hollow stock the "Pines-Way". Simplicity of tooling, uniform accuracy, and ease of operation are proven features of Pines machines which today help hundreds of plants cut product costs. At Pines you'll find an unmatched wealth of bending experience and creative tooling skill readily available to help you develop better methods and save time on production problems.

Write for *Free* **data sheets**

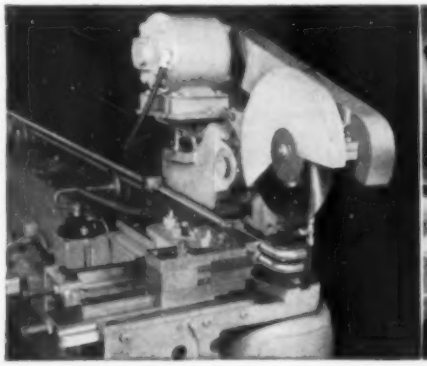
To keep abreast with latest developments in bending, write for copies of "Pines News" —bi-monthly mailing piece that gives facts on new, cost-cutting bending applications.

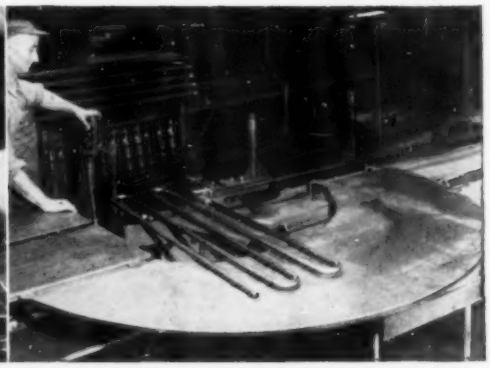
PINES ENGINEERING CO., INC.
Specialists in Tube Fabricating Machinery
693 WALNUT • AURORA, ILLINOIS

4 REFRIGERATION AIR CONDITIONING ELLS — Special Pines Automatic Cut-Off Benders now produce copper ells and return bends at speeds up to 1500 per hour, reduce scrap losses to 1%.

5 ENGINE MANIFOLD TUBES—Short 1½" O. D. steel tube now bent to 1½" c/l radius with flange attached saves space, insures accuracy, cuts costs.

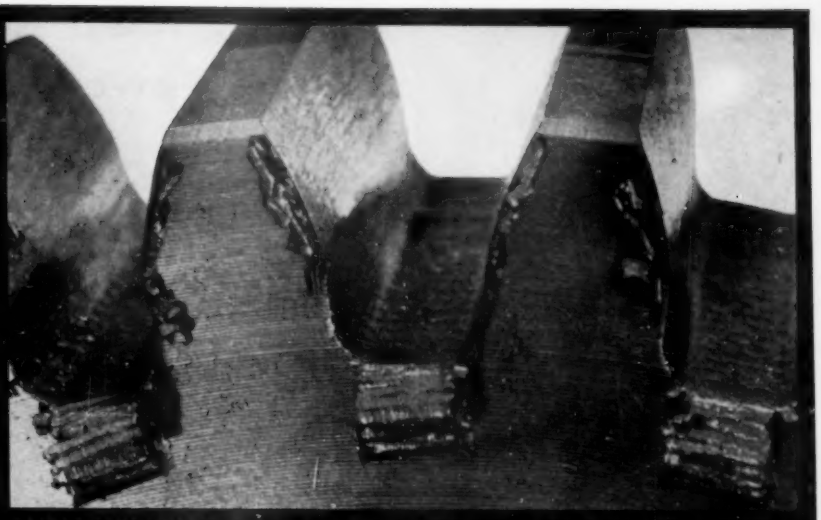
6 BOILER TUBE AND REFRIGERATION COILS — Typical setup bending continuous serpentine coils from ¾" steel tubing. Reduces welding, fabricating costs. Other installations range from ¼" copper up to 3" steel tube.



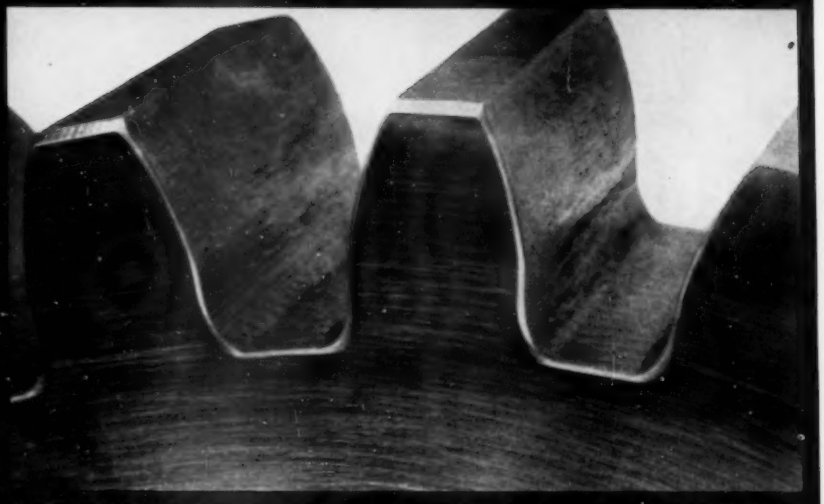


Osborn Brushamatic

. . . rough to finish in one operation



BEFORE BRUSHING. Edges have heavy burrs. Sharp corners permit high stress concentrations . . . possible sources for failure.



AFTER BRUSHING. Burrs are gone . . . smooth, uniform blend on junctures of gear face and involute increase tooth strength.

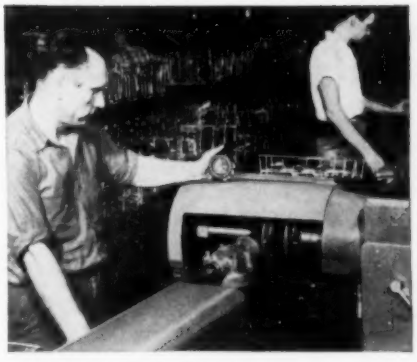
At the push of a button, you can now blend surface junctures on gear teeth . . . at the same time burrs are removed. Each gear tooth is uniform in quality. Production is less costly because it's simpler, faster.

Gears finished on Osborn Brushamatics are stronger, more dependable. By removing sharp corners, stress concentrations are avoided. Thus, there is less chance for failure in severe service.

Your operator simply loads and unloads the work. Brushamatic rotates the piece against revolving brushes on preset time cycles.

An **O**sborn **B**rushing **A**nalyst can show you how to put Brushamatic to work for you. One machine can handle a large variety of work . . . is easy to set up from job to job. Call or write *The Osborn Manufacturing Company, Dept. K-15, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

*Trade-Mark



OSBORN BRUSHAMATIC*. *Saves over 1000 manhours every year. Capable of handling over 2000 parts a day.*

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

how leading car, truck and trailer builders solve production riveting problems with Hannifin "HY-POWER" Hydraulics

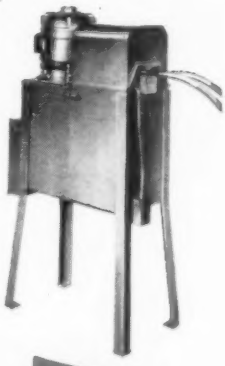
1 They select the correct size "Hy-Power" Hydraulic Cylinders

Hannifin supplies "Hy-Power" Hydraulic Cylinders in 7½ to 100-ton capacities (more in multiple) to exert the force exactly when and where you want it.

2 They mount the cylinders in Hannifin "C"-Frames

The "Hy-Power" line includes standard "C"-frames in a wide variety of sizes and types for portable or stationary use. Or, if your requirements are special, Hannifin will design and build "C"-frames to suit your needs.

3 Power source is the exclusive "Hy-Power" Pressure Generator



Here's Hannifin's patented, noiseless pressure generator. It's a compact unit that combines motor, pump, oil reservoir, control valves and high-pressure intensifier.

HANNIFIN "HY-POWER" RIVETING IS THE LONG-TIME STANDARD OF THE AUTOMOTIVE INDUSTRY

If you're looking for a better riveting method—whether you need one riveter or fifty—discuss it with your Hannifin representative. Meanwhile, get the full story by writing for Bulletin 150.

HANNIFIN

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

Hannifin Corporation, 519 South Wolf Road, Des Plaines, Illinois

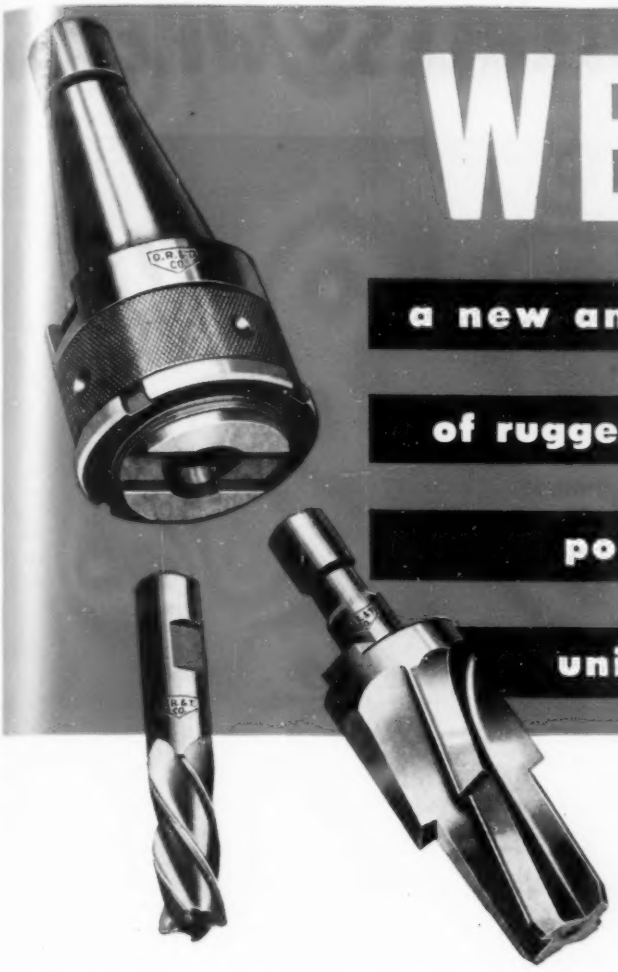
WEJ-LOK

a new and different tool holder

of rugged design, simple to use,

positive locking and

universal application



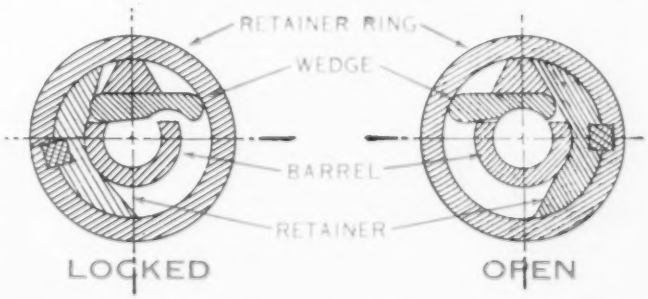
A simple hand spinning of the Wej-Lok retainer ring locks or unlocks inserted tools. Yet, either left or right-hand cutting tools are firmly held by this accurately machined tool holder.

In locked position, the flat surface of holder wedge is tightly seated in mating notched section of tool shank. Normal operating torque tends to further tighten this wedging action, thus, preventing all possibility of tool play or wobble. Where unusually large tools or extra heavy cutting operations are required, provision is made on the holder for use of a Baker drive to augment wedge locking and assure utmost stability.

Wej-Lok tool holder permits universal usage . . . grinding a simple flat area on any tool shank to match holder wedge provides positive locking. You will find Wej-Lok superior in every respect on all drilling, reaming, boring and milling operations.

Note these unusual Wej-Lok features:

1. **Shank and barrel machined from one piece.**
2. **Accurately machined to exacting tolerances.**
3. **Finest quality hardened steel used in all parts.**
4. **Long-life through elimination of wear areas.**
5. **Positive wedge type locking of tools.**
6. **Wedge lock plus Baker drive on larger tools.**
7. **Simple insertion and removal of tools.**
8. **Can be used for right or left-hand cutting tools.**
9. **All tools quickly ground for use in holder.**
10. **Designed for standard straight shank end mills.**



DETROIT REAMER & TOOL CO.

2830 EAST SEVEN MILE ROAD • DETROIT 34, MICHIGAN

D R & T COMPANY

HOW TO BUY CENTERLESS WHEELS

FOR FASTER PRODUCTION AT LOWER COST

...and get "More Use per Dollar"

Look for a rubber bonded wheel that permits both roughing *and* finishing . . . at higher grinding speeds.

To do two jobs efficiently—roughing and finishing—the centerless wheel you buy should have a high grit-carrying bond that will insure maximum metal removal with every pass. A high grit-to-bond ratio produces a fast, free cutting wheel that needs fewer dressings. The rubber bond should also be able to produce desired finishes to required tolerances, even with coarse-grained abrasives. A wheel with these characteristics enables you to do both roughing and finishing operations, simply by controlling the feed rate and the amount of rough stock removed . . . without time consuming wheel changes. In addition, if the wheel is strong enough to permit high speed operation, you can realize substantial savings in production time and costs.

Specify the centerless wheels that give you all these features . . . specify Manhattan Rubber Bonded Centerless Wheels.

MANHATTAN CENTERLESS WHEELS

Manhattan Centerless Grinding and Regulating Wheels are custom-made in the abrasive and bond required for your operations. By using Manhattan Centerless Wheels you are assured heavier metal removal per pass, close tolerances and superior finishes . . . a better job, faster—at lower cost. Their greater strength allows grinding speeds up to 8500 sfpm. Manhattan Regulating Wheels are supplied either plain or core-mounted. Manhattan Core Mountings provide substantial wheel savings.

Ask your Manhattan representative to show you how Manhattan Centerless Wheels and other high speed, heavy duty abrasive wheels last much longer . . . give you "More Use per Dollar".

RM-130

GRINDING WHEEL INSTITUTE MEMBER

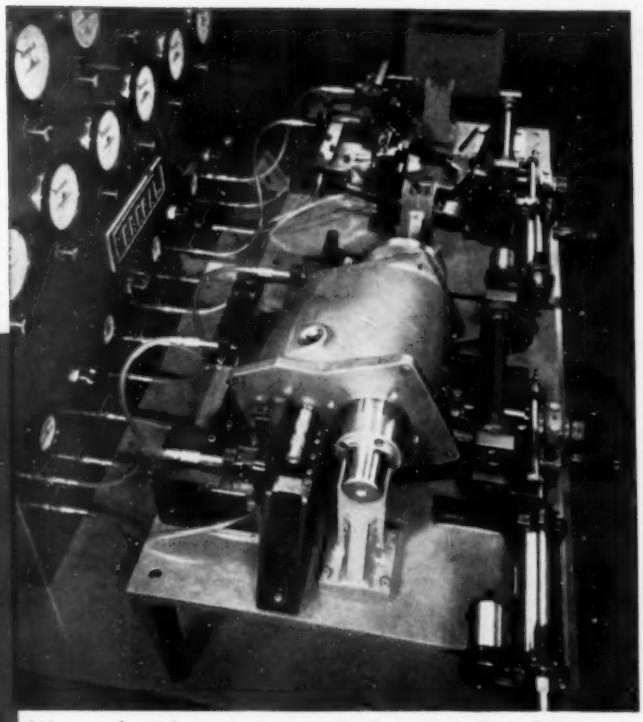
WRITE TO ABRASIVE WHEEL DEPARTMENT
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

R/M

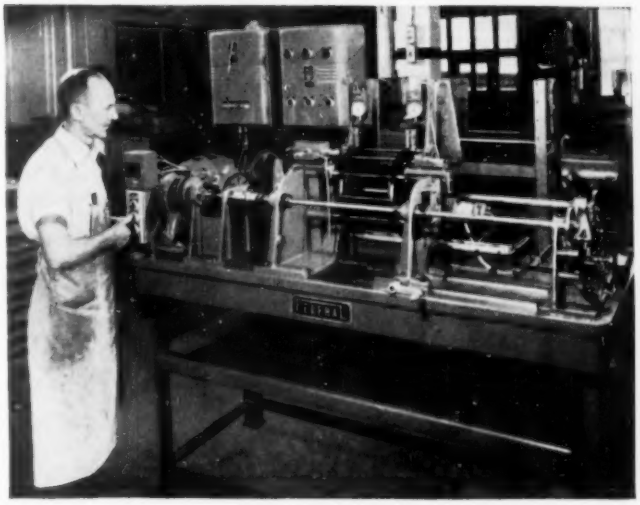
Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

HOW FAR DO YOU WANT US TO GO WITH YOUR AUTOMATION?



We can furnish equipment to check any number of dimensions simultaneously by any basic gaging method — whichever is best suited to the job.

OR We can go the whole way to "Push Button" in-process control. Shown here is one of a group of gages installed in a transfer or in-process production line.



FEDERAL has a wealth of experience in meeting the requirements of modern Automation. From a most complete line of individual dimensional indicating gages to standardized package units for air, electrical, electronic or combination machine controls, we can provide any degree of Automation you desire. Our engineers will gladly cooperate in adapting these to your requirements.

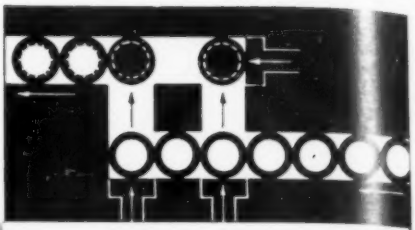
FEDERAL PRODUCTS CORPORATION
5196 Eddy Street • Providence 1, Rhode Island

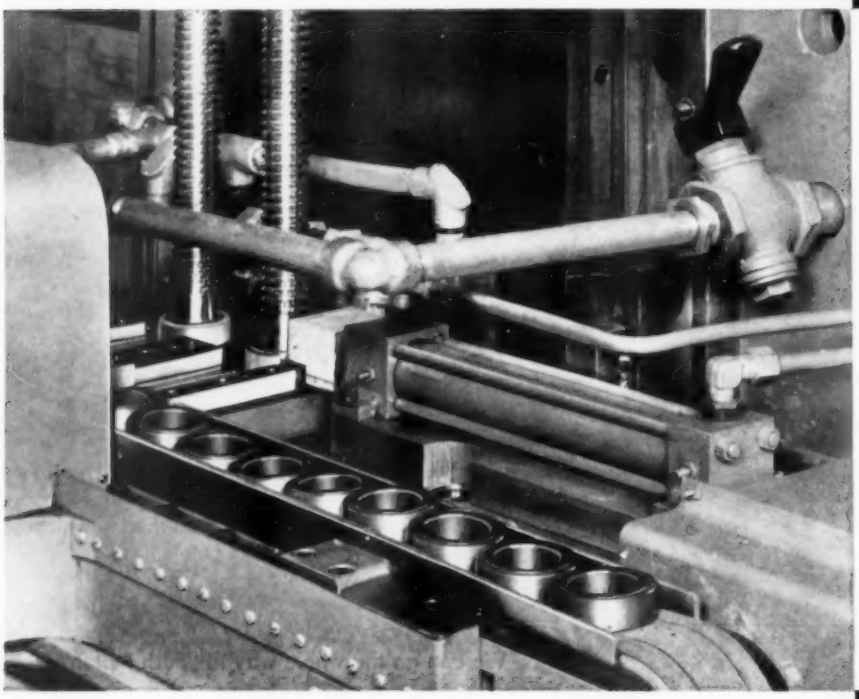
Ask **FEDERAL**

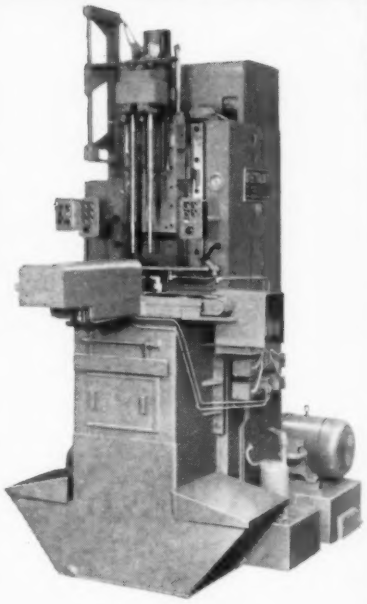
FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines

AUTOMATION IN BROACHING!







PART *Sun Gear*

DETROIT BROACH PROVIDES FULL AUTOMATION WITH FLEXIBILITY OF MANUAL OPERATION

In the designing and manufacture of automatic tooling for this Pull Down Internal broaching machine, Detroit Broach combined all the time and labor saving advantages of automation, plus versatility to permit efficient manual operation when required. This standard machine is designed to support the tail of the broach throughout the entire stroke and, if desired, may be arranged to hold the tool in tension throughout the cut.

On this particular job, parts are loaded, broached and unloaded automatically—maintaining consistent, high quality production WITHOUT AN OPERATOR! Parts are fed to the machine fixture and then carried away on a belt conveyor.

In addition, this machine features:

OPERATION
Broaching 39 involute spline teeth and size minor diameter

PRODUCTION
480 pieces per hour (100% hour)

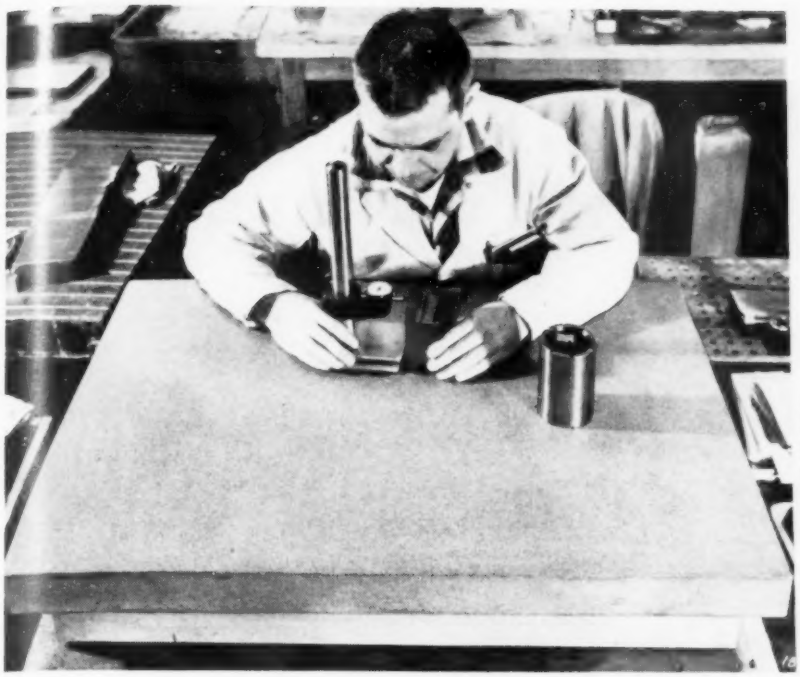
MACHINE
Detroit Broach 10-ton Vertical Pull Down Broaching Machine with 42" stroke.

1. An automatic safety mechanism which must be actuated by both broaches at the top of the stroke before the unloading cylinder will eject the finished parts. This eliminates any possiblity of costly tool breakage and down time.
2. Should anything interrupt this machine's automatic cycle, an operator can step in and run full production manually until automatic cycle is resumed.
3. Use of standard components wherever possible to keep costs low and to assure simple, time-saving maintenance or replacement.
4. Fixtures designed and built for greatest flexibility . . . for easy conversion to hold other parts or for design changes on present parts.
5. Simplicity of design and construction for convenient accessibility . . . for quick, easy inspection and maintenance.

Why not find out how you, too, can benefit from new broaching techniques and tooling advancements. Our sales engineers will be glad to consult with you at your convenience.

Detroit Broach COMPANY
ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



This 4-ledged Taft-Peirce Granite Surface Plate is made of high quality Blue-White Granite. Evenly distributed quartz and feldspar grains stand up under long, hard wear. The mica flakes are extremely fine. The plate is free from residual stresses and will not distort with temperature changes. T-P precision grinding and lapping produce the most accurate surface available to industry today.

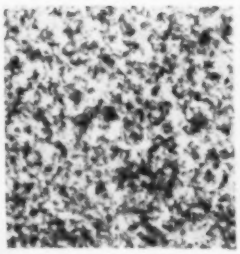
How to Select a Granite Surface Plate

More Tips from TAFT-PEIRCE on Toolroom Equipment

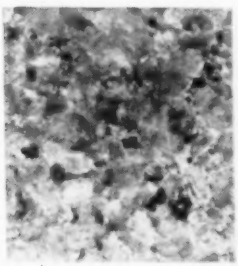
The word "Granite" is at best a vague specification for surface plates. There are many types of granite plates available, and not all are particularly well-suited for long and accurate service. Some granite surface plates wear less, chip less, maintain their accuracy longer than others. Fortunately it is easy to distinguish various kinds of granite by their surface appearance. The four unretouched photographs (enlarged to twice natural size) of several types of granite show what to look for when judging the quality of a granite surface plate.

Best quality granite is almost indestructible. Taft-Peirce Granite Surface Plates are made of very fine-grained Blue-White Granite. Heavy objects dropped on the surface barely powder the stone at *point* of impact.

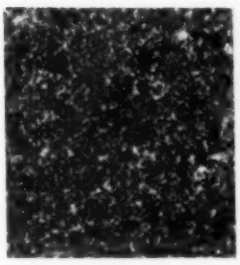
All Taft-Peirce Granite Surface Plates are carefully ground and lapped flat. More than 75 years of experience in making precision products assure maximum accuracy for layout and inspection work. For more information on Taft-Peirce Surface Plates, write for your free copy of the Taft-Peirce Handbook.



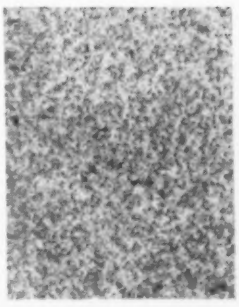
This photograph of gray granite shows the coarse distribution of quartz and feldspar grains, and the larger mica flakes. These clusters of mica wear rapidly and flake out, making larger pits and destroying surface accuracy.



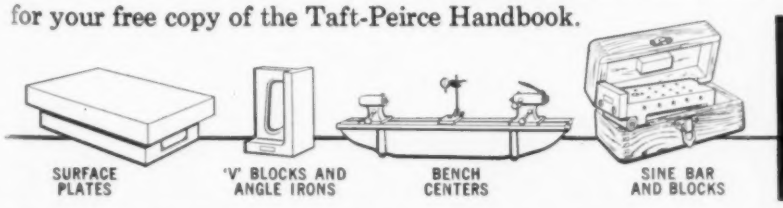
This pink granite has less mica and noticeably larger grains of quartz and feldspar, roughly scattered. Note the coarse, irregular texture of this granite.



Black diabase is composed chiefly of feldspar, hornblende, pyroxene, and black mica, with little or no quartz. These minerals are not quite as hard as quartz, and the mica, especially, flakes out with wear.



This photograph of a Taft-Peirce Granite Surface Plate shows the close, fine-grained texture of quartz and feldspars and the even distribution of extremely small mica particles. This Blue-White Granite from Westerly, R. I., will give long, accurate service.



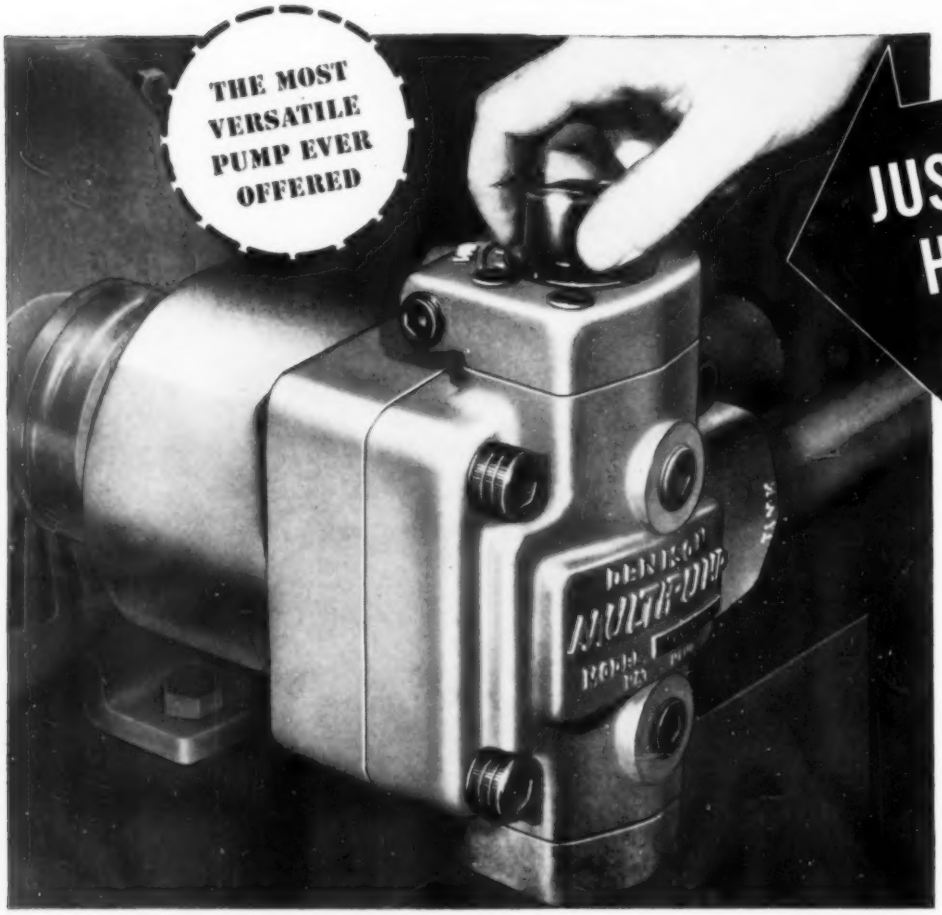
T-P means Top Precision

T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.

DENISON MULTIPUMP

VARIABLE VOLUME VANE PUMP



DENISON MULTIPUMP gives you variable volume at constant speed plus constant volume at variable speed

NEW, EXCLUSIVE MULTIPUMP PRINCIPLE makes possible great savings in horsepower . . . by delivering only the oil needed by the circuit.

SIMPLE, UNIVERSAL CONTROL—in one compact unit—combines features available in other pumps only as optional items . . . and, in most cases, MULTIPUMP eliminates circuit components usually needed in addition to the pump itself.

FINGER-TIP CONTROL. Simple hand dial adjusts volume. Volume is maintained by MULTIPUMP regardless of variations in pressure and pump speed.

and in addition . . .

PRESSURE COMPENSATED, easily adjusted. Can be remotely controlled. Can be vented.

OPERATES COOLER. New Denison design principle circulates oil from tank at all discharge rates, even when pump is compensated.

SEND FOR FACTS. Operating characteristics, sizes and capacities of Denison MULTIPUMP are given in Bulletin 190. Write

THE DENISON ENGINEERING COMPANY
1182 Dublin Road • Columbus 16, Ohio

DENISON Hydr OIL ics

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

AIRengineering at work
REPORT No. 4150.25

Cuts 60 Second Metal Drilling Job *to 15 Seconds . . . with Air Punching Tool*

A sub-contractor for a large auto manufacturer formerly used two men, an electric drill and a drilling jig to drill two ¼" holes in rear auto fenders.

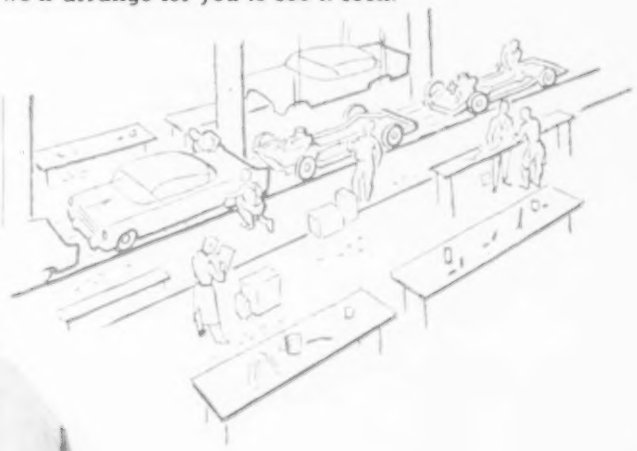
This method required a whole minute and failed to provide uniform results. In addition, paint damage and broken drills caused excess time loss.

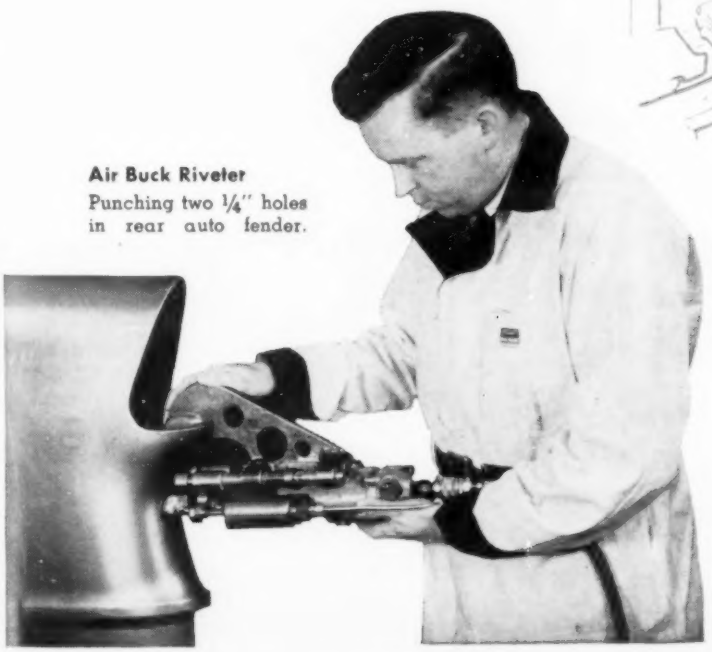
AIRengineering by Ingersoll-Rand solved the problem fast. A size AR130 Air Buck Riveter was equipped with special yoke, punches and stripping mechanisms. The holes are now punched four times faster, with closer tolerances and only *one* man is required instead of two.

If you are in a position to encourage cost-savings in your plant, you should see I-R's confidential manual reports on "AIRengineering at Work". Write on your company letterhead and we'll arrange for you to see it soon.

AIRengineering Manual
Over 100 interesting and helpful case history applications of AIRengineering at work.

Ingersoll-Rand
11 Broadway, New York 4, N.Y.





Air Buck Riveter
Punching two ¼" holes in rear auto fender.

8-257

Tool Steel Topics

BETH EHEM STEEL

...oast Bethlehem products are sold ...acific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

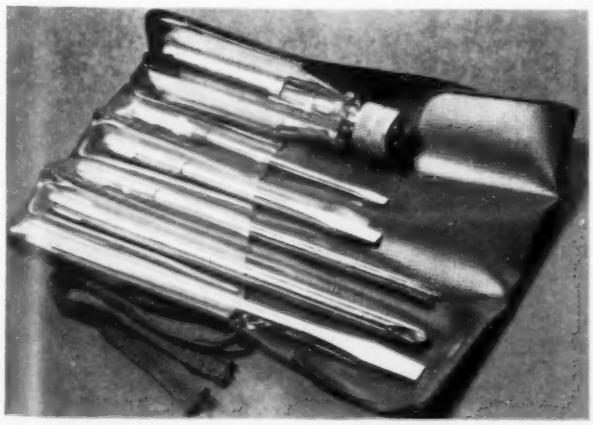
They Wing Screw Drivers at Fast Clip with Dies of BTR

It's efficiency-plus at the busy plant of Oxwall Tool Co., Ltd., Oxford, N. J. For here there's every kind of machine for the high-speed manufacture of all kinds of quality screw drivers. They turn them out by the millions, large and small, including an ingenious worm-like screw driver which can be bent around corners at the touch of a finger.

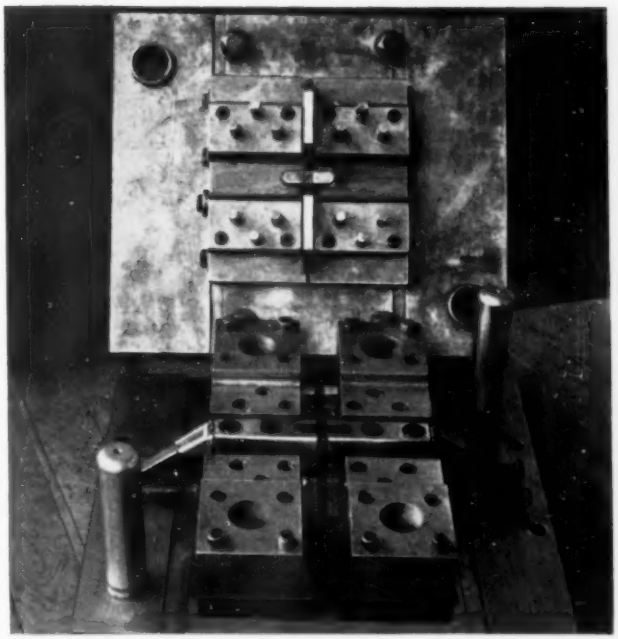
The plant has a battery of 10-ton presses where the wire blank is winged on the end opposite the blade (see illustration above) so that it can be anchored in the plastic handle. The typical forming dies used in this operation are made of BTR (Bethlehem Tool Room) tool steel. Oxwall engineers tell us that these BTR dies, hardened to Rockwell C48-50, are giving long service life in this application.

BTR is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel, perhaps best known for its safe hardening property. It also has good abrasion-resistance and toughness, and is ideal for practically every application where long wear is desirable.

If you would like to give BTR a workout in your shop just put in a phone call to your Bethlehem tool steel distributor. You'll find him well stocked with BTR, and anxious to be of service to you.



Assortment of screw drivers made by Oxwall Tool Co., Ltd. Each blank is winged by a die of BTR tool steel, for firm anchorage in handle. Model shown in illustration at the upper right, with flexible shaft which can be bent as needed, is an ideal time-saver for cramped quarters.



SHOCK-RESISTANCE PAYS OFF AS DIE MADE OF 67 CHISEL PUNCHES HOLES IN HIGHWAY GUARD RAIL

Because of its excellent shock-resisting properties, this die of Bethlehem 67 Chisel tool steel provides economical punching of bolt holes in beam-type highway guard rail. The die, hardened to Rockwell C-51, operates in a 200-ton press. In addition to its shock-resistance, 67 Chisel is wear-resistant, making it ideal for such applications as shear blades, hot-work tools, blanking tools and swaging dies.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Here's How to Harden Tools with Holes

Ordinarily holes in tools cannot be eliminated. Nor can their size or location be changed, in most instances. So steps must be taken to control the ill effects of holes, such as tools cracking during the hardening operation. Although it is impossible to outline a procedure for all tools, the following principles are recommended for those containing holes:

1. Quench tools so that the internal surfaces of the tools harden completely. When holes are relatively large, no special attention may be necessary; for small holes, flush-quenching may be required.

2. If it is possible that effective quenching may not occur completely throughout the holes, pack them so that hardening cannot take place in the holes, assuming that this condition is allowed on the tool. Use clay, asbestos, steel wool or steel inserts.

3. If only the surface of a hole is to be hard, as on a ring die, flush-quench the bore while protecting the outside surface from the quench.

The internal surface of a hole should be either uniformly hard, or uniformly soft. The worst possible condition is an irregular hardness pattern on the inside surface, because the high stress developed may result in cracking.

Index of THE TOOL ENGINEER Advertisers

June 1955 Issue

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

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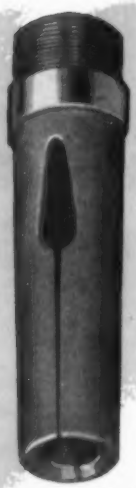
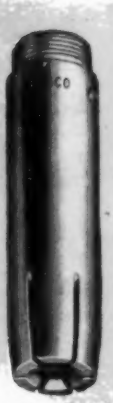
Squirrel Cage Pusher



Conventional Pusher

Heavy Duty Cage-Type Pusher



"Multi-Split" Feed Finger

Master Pusher

Get smoother, faster feeding with

BENCO PUSHERS

BENCO *products include:*

Solid Collets
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Pushers and Feed Fingers
Ejector Collets
Collet Sleeves and Chuck Nuts for B. & S. Machines
Carbide-faced Stock Stops for B. & S. Machines

You get the most out of your machines and reduce stock waste when you use Benco Pushers because they are designed and processed to insure smoother, faster feeding on simple or difficult jobs!

Expertly manufactured from selected alloy steels, properly heat-treated, carefully inspected for accuracy and tension, Benco Pushers out-produce and out-last similar products. As a result, extraordinary production records over a wide range of feeds and speeds are easily achieved on machines equipped with Benco Pushers.

Let us recommend the proper Benco Pushers for your particular requirements. You get immediate delivery on most sizes from our large stock.

Benco **COLLET MANUFACTURING CO.**
Cleveland 14, Ohio

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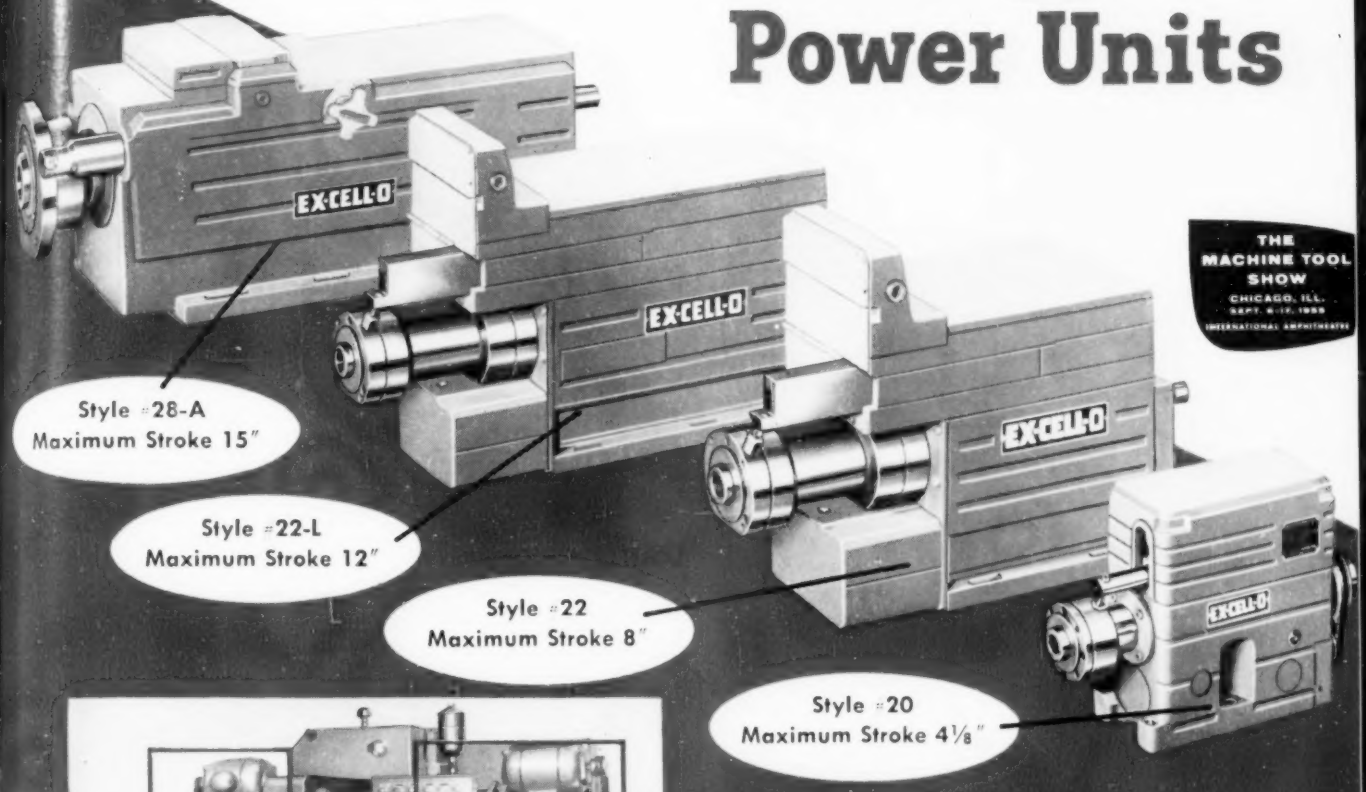
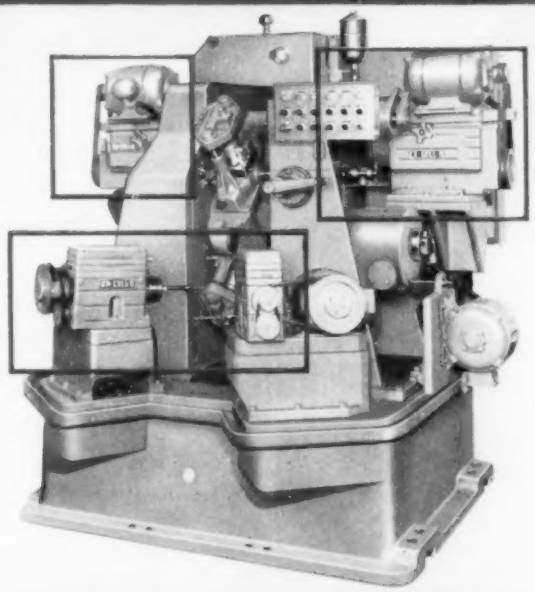
FOR AUTOMATIC CYCLES IN
PRODUCTION MACHINES:

Ex-Cell-O Quill-Type Power Units

XLO
EX-CELL-O for PRECISION





This special machine with automatic indexing fixture core-drills piston pin holes and drills angular oil holes. It uses six Ex-Cell-O Power Units (shown without belt guards) operated from a central push-button station.

Ex-Cell-O Hydraulic Power Units feed and rotate cutting tools in easily controlled automatic cycles. They actuate single tools or multiple spindle heads for such operations as drilling, reaming, counterboring and spot-facing. Hydraulic operation provides smooth, powerful movements.

A machine utilizing Ex-Cell-O Power Units can be very simple, with manual loading and clamping. Or it can be designed with work handling equipment for automation . . .

For complete information, including specifications and installation drawings, ask your Ex-Cell-O Representative or write Ex-Cell-O in Detroit.

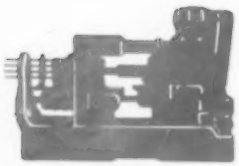
EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

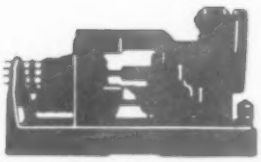
55-12

with the addition of

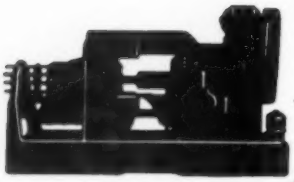
4 New Models



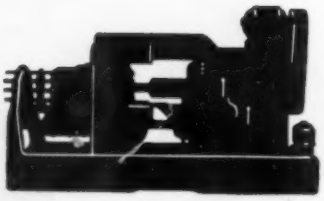
NEW $\frac{5}{8}$" RA-8



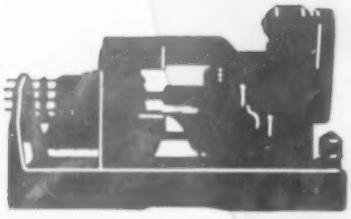
NEW $1\frac{1}{4}$" RB-8



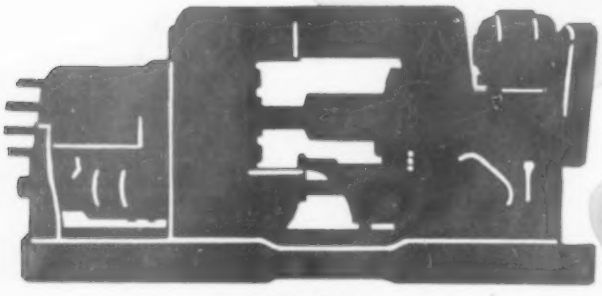
$1\frac{5}{8}$" RB-8



$2\frac{5}{8}$" RB-8



NEW $3\frac{1}{2}$" RB-8



NEW 4" RB-8

Acme-Gridley 8-spindle advantages now extend t ALL ranges of bar work up to 4″ diameters

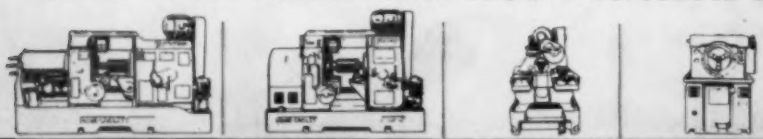
The principal performance advantages of Acme-Gri ley 8-spindle bar automatics now can profitably applied to bar work as small as the capacity ran of a $\frac{5}{8}$″ machine and as large as 4″ diameter. The advantages include:

- faster machining cycle time because of addition end working positions;
- "new machine" reliability longer—with carbide high speed tooling;
- greater accuracy and uniformity of parts wi fewer rejects;
- completion of a greater number of secondary ope ations in the primary machine setup (spindle sto ping mechanism optional), with consequent savin in man hours, floor space and machine inve ment.

And, for help-when-you-need-it, these new mod (and all Acme-Gridleys) are backed up by a wealth "*complete line*" tooling experience (literally thousan of tooling setups) plus a policy for service which h always played a mighty prominent part in maintai ing National Acme's position of leadership.

It will pay you to plan your production the modern Acme-Grid 8-spindle way. Why not ask us to tell you more about it?

SEE US AT THE MACHINE TOOL SHOW • SEPTEMBER 6 TO 17 • BOOTH NUMBERS 324 AND 70



OUR JOB: to provide the *Right Machine* for YOUR JOB

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

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